

#### 5.3.2. ENVIRONMENTAL TESTING

This element includes the efforts to provide all resources necessary to define, document, and analyze the requirements for all environmental tests associated with the SXI SM instrument. This shall include identification and definition of each environmental test, providing the test facilities and test equipment, preparing the test, and the conducting of each environmental test. In addition, this element includes those efforts needed to develop all instrument Environmental Test procedures and deliverables/non-deliverables.

The Environmental Testing of the SXI SM is limited to Sine and Random Vibration Testing.

# 5.4. MASS MODEL FABRICATION, TESTING AND ASSEMBLY

This element includes the efforts required to furnish all the necessary personnel, facilities, services, and materials to support subsystem fabrication, assembly, and test efforts for the SXI Mass Model.

This element includes the efforts required to provide all management functions necessary to support efforts associated with the subsystem fabrication, assembly, and test activities for the SXI mass model. In addition, this element includes those efforts needed to review and approve all subsystem fabrication, assembly, test, and hardware procedures and deliverables/non-deliverables.

#### 5.4.1. Objective Group

This element includes those efforts required to provide all necessary subsystem management, engineering functions, and procurements to fabricate, assemble, and test the MM SXI Objective Group.

#### 5.4.2. Focal Plane Group

This element includes those efforts required to provide all necessary subsystem management, engineering functions, and procurements to fabricate, assemble, and test the MM SXI Focal Plane Group.

#### 5.4.3. Metering Tube Group

This element includes those efforts required to provide all necessary subsystem management, engineering functions, and procurements to fabricate, assemble, and test the MM SXI Metering Tube Group.

#### 5.4.4. Thermal Subsystem

None planned for the SM or MM.

#### 5.4.5. Data Electronics Mass Simulator

This element includes those efforts required to provide all necessary subsystem management, engineering functions, and procurements to fabricate, assemble, and test the Data Electronics Mass Simulator.





#### 5.4.6. Power Electronics Mass Simulator

This element includes those efforts required to provide all necessary subsystem management, engineering functions, and procurements to fabricate, assemble, and test the Power Electronics Mass Simulator.

#### 5.4.7. Cables Mass Simulator

This element includes those efforts required to provide all necessary subsystem management, engineering functions, and procurements to fabricate, assemble, and test the Cables Mass Simulator.

#### 5.4.8. HASS Electronics Mass Simulator

This element includes those efforts required to provide all necessary subsystem management, engineering functions, and procurements to fabricate, assemble, and test the HASS Electronics Mass Simulator.

# 5.5. MASS MODEL INTEGRATION AND TEST

This element includes those efforts required for the technical direction, administration, and control of the SXI MM integration and test program. This element shall also include the development of all procedures and reports related to integration and test. In addition, this element includes those efforts needed to prepare, review and approve all Integration and Test procedures, deliverables/non-deliverables.

This element includes those efforts required for the design, development, preparation, implementation, execution, and documentation of the SXI MM integration and test. In addition, this element includes the assembly and integration of all instrument components into the complete MM. This element also includes those efforts required in the support and generation of documentation and reviews.

#### 5.5.1. MM Instrument Integration And Checkout

This element includes the effort to provide all resources necessary to perform the, mechanical integration of the SXI MM instrument. This effort shall include all tasks involving mounting, alignment, and support. This element includes the effort to accommodate the SXI procedures. In addition, this element includes those efforts needed to develop all Instrument Integration and Checkout procedures and deliverables/non-deliverables.

The MM Checkout consists of verification of the mechanical interfaces and measurement of the mass properties.

#### 5.5.2. MM TRANSPORTATION AND HANDLING

This element refers to the transportation and handling of the SXI MM instrument, and any required MGSE at all times and locations. This element includes the efforts required to provide all resources necessary to handle safely, and transport the SXI MM instrument, and any required MGSE, and all other required items to and from the spacecraft contractor site. Transports shall be performed safely and in a manner compatible with environmental specifications. In addition, this element includes those efforts needed in order to comply with Transportation and Handling procedures and deliverables/non-deliverables requirements.





#### 5.6. OBSERVATORY SITE SUPPORT

This element includes all efforts required to provide all necessary subsystem management, and engineering functions to support the SXI MM integration and test with the spacecraft. Included in this element are efforts in support of documentation and reviews.

#### 5.6.1. OBSERVATORY INTEGRATION AND TEST SUPPORT

This element includes the effort to provide all resources necessary to perform the mechanical integration of the MM Solar X-ray Imager instrument at the spacecraft contractor site. This effort shall include all tasks involving mounting, alignment, of the instrument. In addition, this element includes those efforts needed to develop all Instrument Integration procedures and deliverables/non-deliverables.

#### 6. SXI ENGINEERING MODEL

The SXI EM is developed to prove the designs and procedures for the flight model SXI Instruments. The EM will be temporally delivered to the spacecraft contractor for interface checks, and then returned to LMATC so that it can continue to be used to verify software and procedures. The EM will be maintained at LMATC for the life of the program to be used to verify software, procedures and potential design changes.

#### 6.1. INSTRUMENT DESIGN AND ANALYSIS

This element includes the effort required to provide all management functions necessary to support efforts associated with the subsystem development, design and analysis activities for SXI engineering model. In addition, this element includes those efforts needed to review and approve all subsystem design and analysis deliverables/non-deliverables.

This element includes the effort required to furnish all necessary personnel, facilities, services, and materials to support subsystem development, design and analysis for the SXI engineering model hardware.

#### 6.1.1. Objective Group

This element includes those efforts required to provide all necessary subsystem management and engineering functions to develop, design and analyze the SXI Objective Group. The Objective Group consists of all the parts of the telescope that are mounted on the front end of the metering tube. It includes the X-Ray Mirror, High Accuracy Sun Sensor (HASS), aliveness source, entrance filter, and structural elements. The design of the key structural elements of this group was completed with the SM design in 5.1.1. These items will only need to be updated as necessary.

#### 6.1.2. Focal Plane Group

This element includes those efforts required to provide all necessary subsystem management and engineering functions to develop, design and analyze the SXI Focal Plane Group. The Focal Plane Group consists of all the parts of the telescope that are mounted on the rear end of the metering tube. It includes the CCD Camera filter wheel, Filters, Shutter, and structural elements. The design of the key



#### ATTACHMENT F

S-415-21, Rev. A

structural elements of this group was completed with the SM design in 5.1.2. These items will only need to be updated as necessary.

#### 6.1.3. Metering Tube Group

This element includes those efforts required to provide all necessary subsystem management and engineering functions to develop, design and analyze the SXI Metering Tube Group. The Metering Tube Group consists of the metering tube, the telescope mount, and the rings and brackets that are attached to the metering tube. The Metering Tube is the heart of the telescope structure and the design of the SM Metering Tube Group completed in 5.1.3 will be as close as possible to the final flight design. This design will only need to be updated as necessary.

#### 6.1.4. Thermal Subsystem

This element includes those efforts required to provide all necessary subsystem management and engineering functions to develop, design and analyze the SXI Thermal Subsystem. This subsystem is responsible for maintaining the temperatures of the instrument so temperatures will remain within allowable ranges during the entire life of the mission. This element includes the efforts required for subsystem design and analysis reviews and audits. In addition, this element includes those efforts needed to develop all Thermal Subsystem design and analysis deliverables/non-deliverables.

#### 6.1.5. Data Electronics

This element includes those efforts required to provide all necessary subsystem management and engineering functions to develop, design and analyze the SXI Data Electronics Subsystem. This element includes the efforts required for subsystem design and analysis reviews and audits. In addition, this element includes those efforts needed to develop all Electrical Subsystem design and analysis deliverables/non-deliverables.

This subsystem contains the SXI Command and Data Handling. This subsystem provides the functions for gathering, formatting, and providing the data to the Communications Subsystem for telemetering to the ground; commands are received from the ground through the spacecraft by the Communications Subsystem and provided to the Command and Data Handling to control all of the instrument functions.

#### 6.1.6. Power Electronics

This element includes those efforts required to provide all necessary subsystem management and engineering functions to develop, design and analyze the SXI Power Electronics Subsystem. This element includes the efforts required for subsystem design and analysis reviews and audits. In addition, this element includes those efforts needed to develop all Electrical Subsystem design and analysis deliverables/non-deliverables.





#### 6.1.7. Cables

This element includes those efforts required to provide all necessary subsystem management and engineering functions to develop, design and analyze the Cables for the SXI Instrument. This includes all cables between SXI subsystems including the cables to the SXI Telescope that must cross the XRP platform. The design of these cables will require close coordination with the spacecraft contractor.

#### 6.1.8. SOFTWARE

This element includes those efforts required to provide all necessary subsystem management, engineering and programming personnel, facilities, services equipment and materials to manage, specify design, develop, verify, control the configuration, assure the quality, and maintain all aspects of the software (flight and ground), firmware, and operating systems for the SXI instrument. This element includes those efforts required to support software subsystem requirements, design, and analysis reviews, to produce required software documentation and deliverables/non-deliverables, and to support audits.

#### 6.1.9. SXI Instrument

This element includes those efforts required to provide all necessary subsystem management and engineering functions to develop, design and analyze the parts of SXI design that cannot be allocated to a subsystem. This element includes the SXI telescope top assembly and the SXI instrument top assembly. Other elements of the instrument design and analysis that are not part of a specific subsystem and are not part of the systems engineering task are included here.

#### 6.2. INSTRUMENT FABRICATION, TESTING AND ASSEMBLY

This element includes the efforts required to furnish all the necessary personnel, facilities, services, and materials to support subsystem fabrication, assembly, and test efforts for the SXI Engineering Model instrument including any required spares.

This element includes the efforts required to provide all management functions necessary to support efforts associated with the subsystem fabrication, assembly, and test activities for the SXI engineering model. In addition, this element includes those efforts needed to review and approve all subsystem fabrication, assembly, test, and hardware procedures and deliverables/non-deliverables.

#### 6.2.1. Objective Group

This element includes the efforts required to furnish all the necessary personnel, facilities, services, and materials to support subsystem fabrication, assembly, and test efforts for the SXI Objective Group. The Objective Group consists of all the parts of the telescope that are mounted on the front end of the metering tube. It includes the X-Ray Mirror, High Accuracy Sun Sensor (HASS), aliveness source, entrance filter, and structural elements. This element includes the efforts required for procedure development, reviews, and audits associated with subsystem fabrication, assembly, and test.

This element includes sub-elements for the X-Ray Mirror, HASS, and Entrance Filter subcontracts.





#### 6.2.2. Focal Plane Group

This element includes the efforts required to furnish all the necessary personnel, facilities, services, and materials to support subsystem fabrication, assembly, and test efforts for the SXI Focal Plane Group. The Focal Plane Group consists of all the parts of the telescope that are mounted on the rear end of the metering tube. It includes the CCD Camera filter wheel, Filters, Shutter, and structural elements. This element includes the efforts required for procedure development, reviews, and audits associated with subsystem fabrication, assembly, and test.

This element includes sub-elements for the CCD Detector, Filter Wheel, and Analysis Filter subcontracts.

This Element also includes sub-elements for filter wheel and shutter life tests. A life test Filter Wheel and Shutter will be built, identical to the flight units, and they will be subjected to a life test under vacuum after being subjected to vibration to qualification levels.

#### 6.2.3. Metering Tube Group

This element includes the efforts required to furnish all the necessary personnel, facilities, services, and materials to support subsystem fabrication, assembly, and test efforts for the SXI Metering Tube Group. The Metering Tube Group consists of the metering tube, the telescope mount, and the rings and brackets that are attached to the metering tube. This element includes the efforts required for procedure development, reviews, and audits associated with subsystem fabrication, assembly, and test.

#### 6.2.4. Thermal Subsystem

This element includes those efforts required to provide all necessary subsystem management and engineering functions to fabricate, assemble, and test the SXI Thermal Subsystem. This subsystem is responsible for maintaining the temperatures of the instrument so temperatures will remain within allowable ranges during the entire life of the mission. This element includes the efforts required for procedure development, reviews, and audits associated with subsystem fabrication, assembly, and test. In addition, this element includes those efforts needed to develop all Thermal Subsystem test and hardware deliverables/non-deliverables.

#### 6.2.5. Data Electronics

This element includes the efforts required to furnish all the necessary personnel, facilities, services, and materials to support subsystem fabrication, assembly, and test efforts for the SXI Data Electronics Subsystem. This element includes the efforts required for procedure development, reviews, and audits associated with subsystem fabrication, assembly, and test.

This subsystem contains the SXI Command and Data Handling. This subsystem provides the functions for gathering, formatting, and providing the data to the Communications Subsystem for telemetering to the ground; commands are received from the ground through the spacecraft by the Communications Subsystem and



#### ATTACHMENT F

S-415-21, Rev. A

provided to the Command and Data Handling to control all of the instrument functions.

#### 6.2.6. Power Electronics

This element includes the efforts required to furnish all the necessary personnel, facilities, services, and materials to support subsystem fabrication, assembly, and test efforts for the SXI Power Electronics Subsystem. This element includes the efforts required for procedure development, reviews, and audits associated with subsystem fabrication, assembly, and test.

#### 6.2.7. Cables

This element includes the efforts required to furnish all the necessary personnel, facilities, services, and materials to support subsystem fabrication, assembly, and test efforts for the Cables for the SXI Instrument. This includes all cables between SXI subsystems including the cables to the SXI Telescope that must cross the XRP platform. This element includes the efforts required for procedure development, reviews, and audits associated with subsystem fabrication, assembly, and test.

#### 6.2.8. Software

This element includes those efforts required to provide all necessary subsystem management, engineering and programming personnel, facilities, services equipment and materials to verify, validate, test, control the configuration, assure the quality, and maintain all aspects of the software (flight and ground), firmware, and operating systems for the SXI instrument. This element includes those efforts required to support software subsystem requirements, design, and analysis reviews, to produce required software documentation and deliverables/non-deliverables, and to support audits.

#### 6.2.9. EM Electronics Parts Procurement

This element includes those efforts required to provide all necessary subsystem management and engineering functions to specify and procure all the non-flight electronics parts for the EM SXI Instrument.

If, because of minimum buys, flight grade parts are used in the EM instrument, then these flight grade parts are Procured in element 7.2.9.

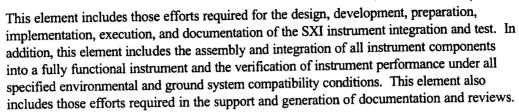
#### 6.3. EM INSTRUMENT INTEGRATION AND TEST

This element includes those efforts required for the technical direction, administration, and control of the EM SXI instrument integration and test program. This element shall also include the development of all procedures and reports related to integration and test. In addition, this element includes those efforts needed to prepare, review and approve all Integration and Test procedures, deliverables/non-deliverables.



#### ATTACHMENT F

S-415-21, Rev. A



The EM will use the same procedures and documentation as will later be used to integrate and test the flight model SXI Instruments. This will allow the SXI-001 to be Integrated and tested with tested and verified procedures.

# 6.3.1. EM INSTRUMENT INTEGRATION AND CHECKOUT

This element includes the effort to provide all resources necessary to perform the electrical, mechanical, and thermal integration of the SXI engineering model. This effort shall include all tasks involving mounting, alignment, and support subsequent instrument checkout. This element includes the effort to accommodate the SXI procedures, data base parameters, and ground support equipment necessary for integration and checkout. In addition, this element includes those efforts needed to develop all Instrument Integration and Checkout procedures and deliverables/non-deliverables.

This element includes those efforts required to provide all resources necessary to define, document, and analyze all the functional tests associated with the SXI. Instrument functional testing includes all end-to-end and performance tests. This element includes definition of each functional test, test facilities, test equipment, and the preparation for and the subsequent conducting of each functional test. In addition, this element includes those efforts needed to develop all instrument Functional Tests procedures and deliverables/non-deliverables.

### 6.3.2. ENVIRONMENTAL TESTING

This element includes the efforts to provide all resources necessary to define, document, and analyze the requirements for all environmental tests associated with the EM SXI instrument. This shall include identification and definition of each environmental test, providing the test facilities and test equipment, preparing the test, and the conducting of each environmental test. In addition, this element includes those efforts needed to develop all instrument Environmental Test procedures and deliverables/non-deliverables.

#### 6.3.3. CALIBRATION

This element includes all efforts required to support the calibration and characterization for the EM SXI instrument. This element includes calibration performance evaluation and trending. This shall include calibration identification, definition, providing the calibration facilities and test equipment, test preparation, and conducting the calibration and characterization of the SXI instrument. This element includes those efforts to develop all calibration and characterization procedures deliverables/non-deliverables.





This element refers to the transportation and handling of the SXI instrument and all the GSE (electrical and mechanical) at all times and locations. This element includes the efforts required to provide all resources necessary to handle safely, and transport the SXI instrument, all instrument GSE (electrical and mechanical), and all other required items to and from all test facilities and the launch site. Transports shall be performed safely and in a manner compatible with environmental specifications. This effort shall also include the transportation to the spacecraft contractor's facility and the instrument contractor's facility of all the equipment remaining at the launch site after the launch. In addition, this element includes those efforts needed in order to comply with Transportation and Handling procedures and deliverables/non-deliverables requirements.

#### 6.3.5. STORAGE AND REFURBISHMENT

This element includes those efforts associated with the management, planning, design, implementation, and execution of an SXI instrument ground storage, maintenance and refurbishment program. In addition, this element includes those efforts needed to develop all Storage, Maintenance and Refurbishment hardware, and procedures and deliverables/non-deliverables.

#### 6.4. OBSERVATORY SITE SUPPORT

The EM SXI will be delivered to the spacecraft contractor for interface checks and temporary integration to the spacecraft prior to the delivery of SXI-001. When these activities are completed it will be returned to LMATC to support ongoing development efforts

This element includes all efforts required to provide all necessary subsystem management, and engineering functions to support the EM SXI instrument integration and test with the spacecraft.

### 6.4.1. OBSERVATORY INTEGRATION AND TEST SUPPORT

This element includes the effort to provide all resources necessary to perform the electrical, mechanical, and thermal integration of the EM Solar X-ray Imager instrument onto GOES-N. This effort shall include all tasks involving mounting, alignment, and support subsequent instrument checkout. This element includes the effort to accommodate the SXI procedures, data base parameters, and ground support equipment necessary for integration and checkout. In addition, this element includes those efforts needed to develop all Instrument Integration and Checkout procedures and deliverables/non-deliverables.

#### 7. SXI-001

#### 7.1. INSTRUMENT DESIGN AND ANALYSIS

This element includes the effort required to provide all management functions necessary to support efforts associated with the update of subsystem development, design and analysis activities for SXI flight models. In addition, this element includes those efforts needed to review and approve all subsystem design and analysis deliverables/non-deliverables. The flight model design activity is limited to update because the design was developed in element





6.1 and the EM was built to the flight design. The updates completed here are to correct any problems found during the EM program (or due to on orbit experience as it applies to tasks 8, 9, and 10).

The sub-elements of 7.1 are the same as those of 6.1, but require update only.

# 7.2. INSTRUMENT FABRICATION, TESTING AND ASSEMBLY

This element includes the efforts required to furnish all the necessary personnel, facilities, services, and materials to support subsystem fabrication, assembly, and test efforts for the SXI instrument including all required spares.

This element includes the efforts required to provide all management functions necessary to support efforts associated with the subsystem fabrication, assembly, and test activities for the SXI flight model. In addition, this element includes those efforts needed to review and approve all subsystem fabrication, assembly, test, and hardware procedures and deliverables/non-deliverables.

The procedures for the fabrication, assembly, and test activities will be updates of the ones used for the same activities on the EM SXI in element 6.2.

#### 7.2.1. Objective Group

This element includes the efforts required to furnish all the necessary personnel, facilities, services, and materials to support subsystem fabrication, assembly, and test efforts for the SXI Objective Group. The Objective Group consists of all the parts of the telescope that are mounted on the front end of the metering tube. It includes the X-Ray Mirror, High Accuracy Sun Sensor (HASS), aliveness source, entrance filter, and structural elements. This element includes the efforts required for procedure updates, reviews, and audits associated with subsystem fabrication, assembly, and test.

### 7.2.2. Focal Plane Group

This element includes the efforts required to furnish all the necessary personnel, facilities, services, and materials to support subsystem fabrication, assembly, and test efforts for the SXI Focal Plane Group. The Focal Plane Group consists of all the parts of the telescope that are mounted on the rear end of the metering tube. It includes the CCD Camera, filter wheel, Filters, Shutter, and structural elements. This element includes the efforts required for procedure updates, reviews, and audits associated with subsystem fabrication, assembly, and test.

### 7.2.3. Metering Tube Group

This element includes the efforts required to furnish all the necessary personnel, facilities, services, and materials to support subsystem fabrication, assembly, and test efforts for the SXI Metering Tube Group. The Metering Tube Group consists of the metering tube, the telescope mount, and the rings and brackets that are attached to the metering tube. This element includes the efforts required for procedure updates, reviews, and audits associated with subsystem fabrication, assembly, and test.





#### 7.2.4. Thermal Subsystem

This element includes those efforts required to provide all necessary subsystem management and engineering functions to fabricate, assemble, and test the SXI Thermal Subsystem. This subsystem is responsible for maintaining the temperatures of the instrument so temperatures will remain within allowable ranges during the entire life of the mission.

This element includes the efforts required for procedure updates, reviews, and audits associated with subsystem fabrication, assembly, and test. In addition, this element includes those efforts needed to develop all Thermal Subsystem test and hardware deliverables/non-deliverables.

#### 7.2.5. Data Electronics

This element includes the efforts required to furnish all the necessary personnel, facilities, services, and materials to support subsystem fabrication, assembly, and test efforts for the SXI Data Electronics Subsystem. This element includes the efforts required for procedure updates, reviews, and audits associated with subsystem fabrication, assembly, and test.

#### 7.2.6. Power Electronics

This element includes the efforts required to furnish all the necessary personnel, facilities, services, and materials to support subsystem fabrication, assembly, and test efforts for the SXI Power Electronics Subsystem. This element includes the efforts required for procedure updates, reviews, and audits associated with subsystem fabrication, assembly, and test.

#### 7.2.7. Cables

This element includes the efforts required to furnish all the necessary personnel, facilities, services, and materials to support subsystem fabrication, assembly, and test efforts for the Cables for the SXI Instrument. This includes all cables between SXI subsystems including the cables to the SXI Telescope that must cross the XRP platform. This element includes the efforts required for procedure updates, reviews, and audits associated with subsystem fabrication, assembly, and test.

#### 7.2.8. Software

This element includes those efforts required to provide all necessary subsystem management, engineering and programming personnel, facilities, services equipment and materials to verify, validate, test, control the configuration, assure the quality, and maintain all aspects of the software (flight and ground), firmware, and operating systems for the SXI instrument. This element includes those efforts required to support software subsystem requirements, design, and analysis reviews, to produce required software documentation and deliverables/non-deliverables, and to support audits.





#### 7.2.9. Flight Electronics Parts Procurement

This element includes those efforts required to provide all necessary subsystem management and engineering functions to specify and procure screen and qualify all the flight electronics parts for the SXI Instrument.

#### 7.3. INSTRUMENT INTEGRATION AND TEST

This element includes those efforts required for the technical direction, administration, and control of the SXI instrument integration and test program. This element shall also include the development of all procedures and reports related to integration and test. In addition, this element includes those efforts needed to update, review and approve all Integration and Test procedures, deliverables/non-deliverables.

This element includes those efforts required for the updating, preparation, implementation, execution, and documentation of the SXI instrument integration and test. In addition, this element includes the assembly and integration of all instrument components into a fully functional instrument and the verification of instrument performance under all specified environmental and ground system compatibility conditions. This element also includes those efforts required in the support and generation of documentation and reviews.

The EM SXI is Integrated and Tested using the flight procedures, therefore in this element the procedures need only to be updated.

#### 7.3.1. INSTRUMENT INTEGRATION AND CHECKOUT

This element includes the effort to provide all resources necessary to perform the electrical, mechanical, and thermal integration of the SXI instrument. This effort shall include all tasks involving mounting, alignment, and support subsequent instrument checkout. This element includes the effort to accommodate the SXI procedures, data base parameters, and ground support equipment necessary for integration and checkout. In addition, this element includes those efforts needed to update all Instrument Integration and Checkout procedures and deliverables/non-deliverables.

This element includes those efforts required to provide all resources necessary to update, and analyze all the functional tests associated with the SXI. Instrument functional testing includes all end-to-end and performance tests. This element includes definition of each functional test, test facilities, test equipment, and the preparation for and the subsequent conducting of each functional test. In addition, this element includes those efforts needed to update all instrument Functional Tests procedures and deliverables/non-deliverables.

#### 7.3.2. ENVIRONMENTAL TESTING

This element includes the efforts to provide all resources necessary to update, and analyze the requirements for all environmental tests associated with the SXI instrument. This shall include identification and definition of each environmental test, providing the test facilities and test equipment, preparing the test, and the conducting of each environmental test. In addition, this element includes those efforts needed to update all instrument Environmental Test procedures and deliverables/non-deliverables.





#### 7.3.3. CALIBRATION

This element includes all efforts required to support the calibration and characterization for the SXI instrument. This element includes calibration performance evaluation and trending. This shall include calibration identification, definition, providing the calibration facilities and test equipment, test preparation, and conducting the calibration and characterization of the SXI instrument. This element includes those efforts to update all calibration and characterization procedures deliverables/non-deliverables.

#### 7.3.4. TRANSPORTATION AND HANDLING

This element refers to the transportation and handling of the SXI instrument and all the GSE (electrical and mechanical) at all times and locations. This element includes the efforts required to provide all resources necessary to handle safely, and transport the SXI instrument, all instrument GSE (electrical and mechanical), and all other required items to and from all test facilities and the launch site. Transports shall be performed safely and in a manner compatible with environmental specifications. This effort shall also include the transportation to the spacecraft contractor's facility and the instrument contractor's facility of all the equipment remaining at the launch site after the launch. In addition, this element includes those efforts needed in order to comply with Transportation and Handling procedures and deliverables/non-deliverables requirements.

#### 7.3.5. STORAGE AND REFURBISHMENT

This element includes those efforts associated with the management, planning, design, implementation, and execution of an SXI instrument ground storage, maintenance and refurbishment program. In addition, this element includes those efforts needed to develop all Storage, Maintenance and Refurbishment hardware, and procedures and deliverables/non-deliverables.

#### 7.4. OBSERVATORY/LAUNCH SITE SUPPORT

This element includes all efforts required to provide all necessary subsystem management, and engineering functions to support the SXI instrument integration and test with the spacecraft. This element includes all necessary subsystem management and engineering functions to support the ground based pre-launch preparations and testing, launch-to-orbit checkout, and on-orbit test and performance demonstration. This element also includes post-launch anomaly resolution support through investigation, resolution, and modification recommendations for follow-on SXIinstruments, and sustaining engineering for the mission life of SXI. Included in this element are efforts in support of Operations documentation and reviews.

#### 7.4.1. OBSERVATORY INTEGRATION AND TEST SUPPORT

This element includes the effort to provide all resources necessary to perform the electrical, mechanical, and thermal integration of the Solar X-ray Imager instrument onto GOES-N. This effort shall include all tasks involving mounting, alignment, and support subsequent instrument checkout. This element includes the effort to



#### ATTACHMENT F

S-415-21, Rev. A

accommodate the SXI procedures, data base parameters, and ground support equipment necessary for integration and checkout. In addition, this element includes those efforts needed to develop all Instrument Integration and Checkout procedures and deliverables/non-deliverables.

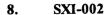
#### 7.4.2. LAUNCH SITE SUPPORT

This element contains efforts necessary to ensure successful launch support for the SXI instrument in conjunction with the spacecraft. This element includes subsystem engineering support to the NASA/GOES Operations Team for launch and orbit raising phases. This element also includes subsystem engineering support to mission simulations/rehearsals during pre-launch preparation phase, review of NASA/GOES Operations Team conversion of contractor contingency procedures and other mission documentation into NOAA compatible formats, development and delivery of transfer orbit databases, and technical operations and instrument and spacecraft development support to NASA for pre-launch reviews upon request. This element includes those efforts needed to develop all flight operations team Launch Support procedures, deliverables, and non-deliverables.

#### 7.4.3. MISSION OPERATIONS SUPPORT

This element includes efforts necessary to support the NASA/GOES Operations Team during development and execution of the post launch test (PLT) program, plus sustaining engineering for the life of SXI. This element includes the development and presentation of hardware and software training courses on the instrument and its interfaces. This element includes design, development, test and implementation (upload) support for any on-board software Random Access Memory code and related procedures, deliverables, and non-deliverables.





The sub-elements of element 8 are identical to those of element 7 and they will not be repeated, except by exception to cover unit unique mods.

#### 9. SXI-003 (Option 1)

The sub-elements of element 9 are identical to those of element 7 and they will not be repeated, except by exception to cover unit unique mods.

#### 10. SXI-004 (Option 2)

The sub-elements of element 10 are identical to those of element 7 and they will not be repeated, except by exception to cover unit unique mods.

# ATTACHMENT G

S-415-26

# CONTRACT DATA REQUIREMENTS LIST FOR THE

# GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE

GOES-N, O, P, Q PROGRAM

**AUGUST 26, 1997** 

# NASA/GODDARD SPACE FLIGHT CENTER GREENBELT, MARYLAND 20771

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# CONTRACT DATA REQUIREMENTS LIST

#### FOR THE

# GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE

# GOES-N, O, P, Q PROGRAM

Prepared by: Original signed by\_\_\_\_\_ 8/26/97 John P. Lahzun Date GOES Systems Manager Approved by: Original signed by 8/26/97 Kenneth O. Schwer Date **GOES Observatory Manager** Original signed by\_\_\_\_\_ 8/26/97 Martin A. Davis Date **GOES Project Manager** Original signed by 8/26/97 Thomas M. Wrublewski Date NOAA Representative



#### **ACRONYMS AND ABBREVIATIONS**

A/I Approval/Information ACS Attitude Control Subsystem

ANSI American National Standards Institute
ASQC American Society for Quality Control

BBCAL Blackbody Calibration
BOL Beginning of Life

CCB Configuration Control Board
CCR Configuration Change Request
CDA Command and Data Acquisition

CDR Critical Design Review

CDRL Contract Data Requirements List

CI Configuration Item
CIL Critical Items List

CIIL Configuration Item Identification List

CM Configuration Management COTS Commercial Off The Shelf

CPT Comprehensive Performance Test
CSCI Computer Software Configuration Item
CWBS Contract Work Breakdown Structure

DIII Delta III

DIV Delta IV (CCR4353C, Mod85)

DCN Documentation Change Notice

DID Data Item Description
DOD Depth of Discharge
DOD Department of Defense

DPA Destructive Physical Analysis

DRD Description of Required Documentation

EIRR External Independent Readiness Review

EMC Electro-Magnetic Compatibility
EMI Electro-Magnetic Interference

EMWIN Emergency Managers Weather Information Network

EOL End of Life ER Eastern Range

ESD Electrostatic Discharge

FMA Final Mission Analysis

FMEA Failure Modes and Effects Analysis

FOV Field Of View

GFE Government Furnished Equipment



GMI Goddard Management Instruction

GOES Geostationary Operational Environmental Satellite

GOP Ground Operations Plan
GSE Ground Support Equipment
GSFC Goddard Space Flight Center
GSI Government Source Inspection

GTACS GOES Telemetry and Command System

GVAR GOES Variable (Re-Transmitted Data Format)

HC/EC Hardcopy/Electronic Copy

INR Image Navigation and Registration

LOR Launch and Orbit Raising

MA Mission Assurance

MAMP Mission Assurance Management Plan

MDL Multiuse Data Link
MLI Multi Layer Insulation
MOI Moment of Inertia

MOR Mission Operations Review MPS MDL Processing System MRB Material Review Board

NASA National Aeronautics and Space Administration

NHB NASA Handbook

NMI NASA Management Instruction

NOAA National Oceanic and Atmospheric Administration

NTACTS GOES-N Telemetry Acquisition and Command Transmission System

OATS Orbit and Attitude Tracking System

OBC On-Board Computer

OGE Operations Ground Equipment

PDF Portable Document Format
PDR Preliminary Design Review
PER Pre-Environmental Review

PLT Post Launch Testing

PMA Preliminary Mission Analysis

PPL Preferred Parts List
PSR Pre-Shipment Review
PWB Printed Wiring Board

QA Quality Assurance

S/C Spacecraft

SCR Systems Concept Review





| CEL ( | a                                   |
|-------|-------------------------------------|
| SEM   | Space Environment Monitor           |
| SEU   | Single Event Upset                  |
| SOCC  | Satellite Operations Control Center |
| SOH   | Spacecraft Operations Handbook      |
| SOW   | Statement of Work                   |
| SSGS  | Spacecraft Support Ground System    |
| SSPP  | System Safety Program Plan          |

STD Standard

TACTS Telemetry Acquisition & Command Transmission System

TBS To Be Specified
TMM Thermal Mass Model

U/AR Update/As Required

WCDAS Wallops, Va. Command and Data Acquisition Station

WEFAX Weather Facsimile WWW World Wide Web





# TABLE OF CONTENTS

| 1.0    | Introduction  |
|--------|---|
|        | 1.1 Applicable Documents                              |
|        | 1.2 CDRL Description                                  |
| 2.0    | Distribution and Delivery                             |
|        | 2.1 General   |
|        | 2.1 General 2.2 CDRL Item Delivery                    |
|        | 2.3 Delivery Media                                    |
|        | 2.4 Documentation Change Procedures                   |
|        | 2.5 Miscellaneous Review Requirements                 |
| Data 1 | Item Descriptions                                     |
|        | •   |
|        | Program Management                                    |
|        | Program Status Reviews                                |
|        | Schedule Reports                                      |
|        | GOES N Data Book                                      |
|        | Configuration Control Board (CCB) Documentation       |
|        | ECPs, Deviations and Waivers                          |
|        | Engineering Drawings and Change Notices               |
|        | Hardware/Software Configuration Management Plan       |
|        | Configuration Item Identification List                |
|        | External Independent Readiness Review                 |
|        | System Engineering                                    |
|        | System Concept Review Data Package                    |
|        | Preliminary Design Review (PDR) Data Package          |
|        | Critical Design Review (CDR) Data Package             |
|        | Mission Operations Review (MOR) Data Package          |
|        | Pre-Environmental Review (PER) Data Package           |
|        | Pre-Shipment Review (PSR) Data Package                |
|        | Flight Operations Review (FOR) Data Package           |
|        | Spacecraft Launch Readiness Review (LRR) Data Package |
|        | GFE Instrument Interface Documentation                |
|        | System Requirements Traceability Database             |
| •      | Performance Verification Plan                         |
|        | Performance Verification Specification                |
|        | Spacecraft Design Specification                       |
|        | ESD & SEU Prevention Plan                             |
|        |   |
|        | Fields-of-View Analysis EMC/EMI Compatibility Plan    |
| âh     | DIVICADIVIT COMPANDING FLAM                           |





# TABLE OF CONTENT

| System Eng   | gineering - Cont.   |
|--|---|
|  | ematics & Block Diagrams  |
|  | ris Generation Analysis Report                                      |
|  | iation Shielding and Dose Analysis Report                           |
|  | ended Life Analysis (8 operations/2 storage) (CCR4353C, Mod85)      |
| our in . Champaight in the sea in the section of th |   |
|  | Management  |
|  | cecraft Photographs/Videos  |
|  | s Properties Report   |
| Pow  | ver Profile Report  |
| Subsystem  | Design & Analysis   |
| Con  | nponent and Subsystem Design Specifications                         |
|  | system & Component Review Data Package                              |
|  | ctural and Mechanical Subsystem Performance Analysis Report         |
|  | ctural and Dynamic Models and Model Verification Plan               |
|  | ss Analysis   |
|  | rmal Distortion Models and Model Verification Plan                  |
| Pro  | oulsion Subsystem Performance Analysis Report                       |
|  | tude Control Subsystem (ACS) Performance Analysis Report            |
|  | tude Control Subsystem (ACS) Detail Description                     |
|  | rmal Subsystem Performance and Analysis Report                      |
|  | rmal Math Models  |
|  | ver Subsystem Analysis Report                                       |
|  | nmunications Subsystem Performance Analysis Report                  |
|  | nmunications Subsystem Component Computer Simulation Models         |
|  | emetry & Command Performance Analysis                               |
|  | emetry and Command Handbook   |
|  | nmand Encryptor M & O Manual and Interface Description Document     |
|  | chanisms Performance Analysis Report                                |
|  | ware Requirements Specification                                     |
|  | ware Design Document  |
| Soft   | ware Test Plan  |
|  | ware Test Procedures  |
|  | ware Test Report  |
|  | sion Description Document   |
|  | ware User and Maintenance Manual                                    |
|  | nware Support Manual  |
|  | tude Control Subsystem (ACS) Algorithms Document                    |
|  | etrical Power and Distribution Subsystem (EPDS) Algorithms Document |
|  | ht Computer Design Description                                      |
| Soft   | ware Management, Development, and Assurance Plan                    |
|  | and the Hamilaton Decision Decision to                              |







# TABLE OF CONTENTS

| Subsystem Design & Analysis - Cont.   |
|---|
| Spacecraft Emulator User's Operations and Maintenance Manual                        |
| SEM Data and Calibration Handbook   |
| Spacecraft Magnetic Control Plan for Magnetometer Performance Assurance             |
| SXI Pointing & Jitter Analysis  |
| INR System Description and Analysis Document  |
| INR Related System Performance Report.  |
| Contamination Control Plan  |
|   |
| Subsystem Fabrication, Assembly & Test  |
| Component and Subsystem Test Procedures   |
| Component and Subsystem Test Procedures  Component and Subsystem Test Data Packages |
| Component and Subsystem Test Data Fackages  |
| Integration & Test  |
| Spacecraft Test Procedures  |
|   |
| Spacecraft Test Data Package  |
| Performance Verification Reports  |
| Launch Site Integration Plan  |
| Launch Commit Criteria  |
| Launch Site Test Procedures   |
| Ground Operations Plan  |
| Missile System Pre-Launch Safety Package  |
| Transportation and Handling Plan & Procedures                                       |
| Ground Storage Plan   |
| Assembly, Integration and Test Personnel Ground System Training Package             |
| Spacecraft System Post-Storage Integration and Test Training Documentation          |
| Spacecraft Thermal Vacuum (SCTV) Test Training Documentation                        |
| Instrument Test and STE Training Documentation (CCR4364B, Mod97)                    |
|   |
| Spacecraft Support Ground System Modifications                                      |
| Telemetry and Command System (GTACS) Design and Implementation                      |
| Telemetry Acquisition and Command Transmission System (NTACTS) Design and           |
| Implementation  |
| Orbit and Attitude Tracking System (OATS) Design and Implementation                 |
| MDL Receive System & Archive (MRS&A) Design and Implementation                      |
| Spacecraft Support Ground System Interface Specification                            |
| Dynamic Interaction Diagnostic (DID) Design and Implementation                      |
|   |
| Flight Operations   |
| Spacecraft Operations Handbooks   |
| Spacecraft Training Program Plan  |
| Spacecraft Mission Operations Plan  |
| Spacecraft On-Orbit Storage Plan  |
| Spacecraft De-orbit Plan  |
| Spacestart De-010ft 1 fall  |





# TABLE OF CONTENTS

|  | Spacecraft Engineering Handover Review                                 |
|--|--|
|  | Spacecraft Launch and Orbit Raising Data Review                        |
|  | Database Update and Delivery Process Training Documentation            |
|  | Console Manual and PROC Training Documentation                         |
|  | ETE Test Training Documentation (CCR4364B, Mod97)                      |
| <u>Perfor</u>  | rmance Assurance   |
| Page and address on the decision of the decisi | Previously Qualified Hardware and Software Report                      |
|  | Safety Noncompliance Report  |
|  | System Safety Program Plan   |
|  | Operations Hazard Analysis   |
| Launc  | h Vehicle  |
|  | Spacecraft/Launch Vehicle Interface Control Document                   |
|  | Preliminary Mission Analysis (PMA) Report                              |
|  | Final Mission Analysis (FMA) Report                                    |
|  | Booster on Stand or Pre-Vehicle on Stand (Pre-VOS) Review Data Package |
|  | Launch Vehicle Design Certification Review (DCR)                       |
|  | Spacecraft/Launch Vehicle Interface Requirements Document              |
|  | Mission Integration Program Kickoff Review                             |
|  | Launch Services System Effectiveness (LSSE) Program Plan               |
|  | Launch Vehicle Requirements Review Data Package                        |
|  | Delta IV Launch System Training Data Package                           |
|  | Mission Unique Design Review #1Package                                 |
|  | Mission Unique Design Review #2Package                                 |
|  | Launch Vehicle Component and Subsystem Test Procedures                 |
|  | Launch Vehicle Component and Subsystem Test Data Packages              |
|  | Launch Vehicle Launch Site Integration Plan                            |
|  | Launch Vehicle Pre-Installation Reviews Data Package                   |
|  | Final Loads Verification Review Data Package                           |
|  | Launch Vehicle Launch Site Test Procedures.                            |
|  | Integrated Spacecraft Handling Plan                                    |
|  | Launch Vehicle Pre-Shipment Review (PSR) Data Package                  |
|  | Launch Vehicle Countdown Procedures and Deviations                     |
|  | Launch Vehicle Launch Commit Criteria                                  |
|  | Senior NASA Management Mission Readiness Review Data Package           |
|  | Pre-Payload Mate Review  |
|  | Launch Readiness Review (LRR) Data Package                             |
|  | Launch Vehicle Post Launch Data Report                                 |
|  | Launch Operations Training Documentation (CCR4364B, Mod97)             |
|  |  |

CCR4353C Mod85





#### 1.0 INTRODUCTION

This document defines the Contract Data Requirements List (CDRL) items that shall be provided by the GOES spacecraft contractor, for the GOES-N/Q spacecraft and the launch vehicle/services.

Section 1.0 includes the introduction and description of the CDRL document. Section 2.0 identifies the mailing and/or distribution and delivery for the CDRL documents, and is followed by the Data Item Description's (DID's) for each CDRL item in section 3.0.

The terms satellite and spacecraft are used interchangeably in this document. When either term is used, it is defined to include the payload GFE instruments consisting of the Imager, Sounder and Solar X-Ray Imager.

#### 1.1 APPLICABLE DOCUMENTS

The following documents of the issue listed, or in effect at the time of the request for proposal, form a part of this document to the extent specified herein. In the event of conflict between documents specified herein and other detailed content of this document, this document shall be the superseding requirement.

### 1.1.1 Goddard Space Flight Center Documents

535-TIP-CPT-001

Specification for Contractor-Provided Training, dated August

1995

#### 1.1.2 NASA Documents

NMI 1700.8

Policy for Limiting Orbital Debris Generation, dated April 5,

1993

NSS 1740.14

NASA Safety Standard, Guidelines and Assessment Procedures

for Limiting Orbital Debris, dated August 1, 1995

NASA-STD-2100-91

NASA Software Documentation Standard Software

Engineering Program, dated July 29, 1991

NASA Reference

Publication 1124

Outgassing Data for Selecting Spacecraft Materials

S-415-23

Statement of Work for the Geostationary Operational

**Environmental Satellite** 

S-415-27

Program Review Requirements for the GOES-N, O, P, Q

Program

S-415-28

Fallout Plate Installation and Removal Procedure and Fairing

Tapelift Sampling Plan





Launch Site Purge Plan for the Geostationary Operational

Environmental Spacecraft (Satellite)

### 1.1.3 Military Standards and Specifications

MIL-STD-490A

S-415-29

Military Standard Specification Practices, dated June 4, 1985

MIL-STD-498

Software Development and Documentation, dated December 5, 1994

MIL-STD-961D

DOD Standard Practice, Defense Specifications, dated

March 22, 1995

MIL-STD-973

Military Standard-Configuration Management

MIL-P-27401C

Propellant, Nitrogen: Liquid and Gas

#### 1.1.4 Department of Defense Standards

DOD-STD-2167A

Defense System Software Development, dated February 29, 1988

**DOD-STD-2168** 

Defense System Software Development,

dated April 29, 1988

#### 1.1.5 NOAA Documents

S24.801

Preparation of Operation and Maintenance Manual, revised

copy dated December 2, 1988

S24.802

General Requirements for Ground Electronic Equipment,

revised copy dated July 15, 1992

S24.803

Cable and Wire Identification, revised copy

dated July 19, 1990

S24.804

General Requirements for Training on Electronic

Equipment, revised copy dated April 19, 1994

S24.805

Spare Parts, revised copy dated January 24, 1990

#### 1.1.6 Space Systems/Loral Documents

DRL-504-02

Operations Ground Equipment Interface Specification





#### 1.2 CDRL DESCRIPTION

The CDRL in Table 1 uses a functional category breakdown structure to segregate the CDRL Data Item Descriptions (DIDs). Each column in Table 1 is described below.

#### 1.2.1 Data Item

This information in the Data Item column consists of a prefix, followed by a reference to a functional category breakdown structure element, and a sequential number that is used to identify a specific document in a specific functional category breakdown structure element, as illustrated below.

|                                      | XXX | X-XXX | ·XXX |
|--------------------------------------|-----|-------|------|
| Data Item Prefix -                   |     |       |      |
| Functional Category Element - ———    |     |       |      |
| Sequential Number of the CDRL Item - |     | ,     |      |

The relationship between the Data Item and the functional category elements are described below.

| Data Item Prefix | Functional Category Element                    |  |  |  |
|------------------|--|--|--|--|
| PM               | Program Management                             |  |  |  |
| SE               | System Engineering                             |  |  |  |
| SM               | Spacecraft Management                          |  |  |  |
| SDA              | Subsystem Design & Analysis                    |  |  |  |
| SFAT             | Subsystem Fabrication, Assembly & Test         |  |  |  |
| I&T              | T Integration & Test                           |  |  |  |
| GND              | Spacecraft Support Ground System Modification  |  |  |  |
| OPS              | Flight Operations                              |  |  |  |
| PA               | Performance Assurance                          |  |  |  |
| LV               | Launch Vehicle/Services and Related Activities |  |  |  |

#### 1.2.2 Title Description

The CDRL Title describes the required data, or document that is traceable to specific elements of the functional category breakdown structure.





#### 1.2.3 Submission

The data in the columns titled "Submission" consists of the information that is described below.

- a. <u>A/I</u>. If the DID document is identified by an "A", then it must be approved by NASA and all subsequent changes to the CDRL items identified by an "A" require approval of the NASA Contracting Officer prior to implementation.
  - The CDRL items identified by an "I" must be submitted to GSFC for information. These documents will be reviewed by NASA personnel, and the contractor will be requested to make changes to the documents, where errors or omissions are noted.
- b. <u>Frequency</u>. The frequency for the data submission will be identified by one of the following items: Bimonthly, Biweekly, Quarterly, or Update as Required (U/AR).
- c. <u>Initial</u>. The data in the sub-column titled "Initial" will be used to describe when the initial copy of the document, or data needs to be submitted to GSFC.
- d. <u>Subsequent</u>. The data in the sub-column titled "Subsequent", is used to describe when up-to-date copies of the document or data needs to be submitted to GSFC.



#### 1.2.4 Distribution Codes

The Distribution Codes are used to identify the address to which the contractor will need to mail the CDRL data or documents. The specific addresses are described in paragraph 2.0.

#### **1.2.5** Copies

The total number of the hardcopy documents that need to be delivered is identified in the column titled "TOTAL HARD COPIES".



#### 2.0 DISTRIBUTION AND DELIVERY

#### 2.1 GENERAL

The distribution and delivery of the CDRL data items shall be as described in Table 1.

The original transmittal letter for all deliverables shall be addressed to the GOES Contracting Officer, Code 415 at GSFC.

#### 2.2 CDRL ITEM DELIVERY

Hard copies of the CDRL items in Table 1 shall be delivered to the distribution codes indicated below. Documentation items that need multiple copy delivery at GSFC shall be mailed to the GOES Project Library for internal distribution.

The hard copy distribution list and the quantities of the hard copies, will be evaluated following successful acceptance testing of the electronic data delivery system. Following this evaluation by NASA and the contractor, some of the CDRL items may be deleted and the number of deliverable hard copies may be reduced.

Electronic copy delivery of the CDRL items that are specified for this form of delivery shall be compatible with the requirements that are specified in the GOES N-Q Statement of Work, S-415-23, Section 1.3.



| Distribution Code | Address   |
|-------------------|---|
| A                 | NASA/Goddard Space Flight Center<br>Code 415, GOES Project Office Library<br>Greenbelt, MD 20771                                      |
| В                 | •NASA/Goddard Space Flight Center GOES Project Resident Office •NASA Launch Vehicle GOES Project Resident Office (for CDRL LV-3.8-XX) |
| C                 | Attendees at each Review  |

#### 2.3 DELIVERY MEDIA

#### 2.3.1 General

The delivery media for CDRL data documentation items shall be as described in Table 1.

The following definitions shall apply in all discussion of documentation media:



a. <u>Hardcopy (HC)</u> - Data typed, drawn or printed on paper by common conventional practices. By these means, either the original, a reproducible or the record copy shall be produced, or reproduced, for distribution as printed copies.



- b. <u>Electronic Copy (EC)</u> Data which is recorded by word processors, computerized data processing systems, or electronic storage devices such as magnetic tapes and disks. The data format of these devices shall be agreed to by GSFC and the contractor prior to use.
- c. <u>Film</u> Data which exists on photographic films such as micrographs, aperture cards, photographs, motion picture films, film images, video tapes or transparencies.

#### 2.4 DOCUMENTATION CHANGE PROCEDURES

The documentation change procedures that shall be followed are described below.

- a. The contractor shall issue documentation change notices (DCN's) whenever minor changes or updates occur in data items that have been delivered to NASA.
- b. Change bars shall be used to indicate changes or updates.
- c. When major changes to a document are made, a complete revision of the document shall be issued and delivered to NASA.

#### 2.5 MISCELLANEOUS REVIEW REQUIREMENTS



The miscellaneous review requirements are described in the S-415-27 Program Review Requirements document and are in addition to the Spacecraft Reviews that are also described in the S-415-27 Program Review Requirements document. The hardcopy documentation delivery requirements for each of these reviews is described below. All of the review copies shall be mailed to the GSFC GOES Project Office Library as indicated in paragraph 2.2, fourteen (14) days prior to the review.

The contractor shall provide electronic distribution of the material for each review in addition to the hardcopy distribution that is described below in Table 2.5-1.





# TABLE 2.5-1 MISCELLANEOUS REVIEW DOCUMENTATION

| REVIEW   | S-415-27<br>Para.<br>Reference | Review<br>Copies      | Copies For Review Attendees      |
|--|--------------------------------|-----------------------|----------------------------------|
| A. Software Subsystem Reviews  | 1.4                            |                       |                                  |
| Concept Review Requirements Review   |                                | 5<br>5                | 20<br>20                         |
| Preliminary Design Review Critical Design Review Test Readiness Review   |                                | 5<br>5<br>5           | 20<br>20<br>20                   |
| Acceptance Review  |                                | 5                     | 20                               |
| B. SSGS Reviews  | 1.5                            | •                     |                                  |
| System Concept Review Preliminary Design Review Critical Design Review Pre-Ship Review Final Acceptance Review |                                | 5<br>5<br>5<br>5<br>5 | 20<br>20<br>20<br>20<br>20<br>20 |
| C. Spacecraft Emulator Reviews   | 1.6                            |                       |                                  |
| System Concept Review Preliminary Design Review Critical Design Review Pre-Ship Review                         |                                | 5<br>5<br>5<br>5      | 20<br>20<br>20<br>20             |
| D. Electronic Data Distribution System Reviews   | 1.7                            |                       |                                  |
| Critical Design Review   |                                | 5 .                   | 20                               |









|           |   |            | -                          |   |                                |  |                         |      |   |       |                               |
|-----------|---|------------|----------------------------|---|--------------------------------|--|-------------------------|------|---|-------|-------------------------------|
| DATA ITEM |   | SUBMISSION |                            |   |                                | an authoritiski irdnominika van oon  | HARD COPY<br>DIST. CODE |      |   | TOTAL |                               |
| DAIAIIEM  | TITLE   | A/I        | FREQ                       | INITIAL   | SUBSEC                         | UENT   | MEDIA                   | Α    | В | С     | HARD<br>COPIES                |
|           | PROGRAM MANAGEMENT                                  |            |                            |   |                                | The state of the s |                         |      |   |       |                               |
| PM-1.1-01 | Program Status Reviews                              | I          | See DID                    | 3   |                                | with editor skills and single-   | 11                      | 2    | 1 | 30    | 33                            |
| PM-1.1-02 | Schedule Reports                                    | 1          | Monthly                    | 2   |                                | State of the contract of the c | 11                      | 3    | 1 |       | 4                             |
| PM-1.1-03 | GOES-N Data Book                                    | A          | U/AR for<br>each satellite | Review copies 1<br>year prior<br>to each launch | Distrib<br>copies 3 after reco | nonths<br>tipt of  | 11                      | 1000 |   |       | 1000<br>for each<br>satellite |
| PM-1.3-01 | Configuration Control Board (CCB) Documentation     | I          | U/AR                       | As Generated                                    | *                              | activate charter charter control contr | 11                      | 2    | 1 |       | 3                             |
| PM-1.3-02 | ECP's, Deviations and Waivers                       | A          | U/AR                       | As Generated                                    |                                | Conditional designation of   | 11                      | 4    | ı |       | 5                             |
| PM-1.3-03 | Engineering Drawings & Change Notices               | I          |                            | As Released                                     |                                | and the second control of the second control | 11                      | 1    |   |       | l                             |
| PM-1.3-04 | Hardware/Software Configuration Management Plan     | I          | U/AR                       | 4   | 5                              |  | 11                      | 4    | 1 |       | 5                             |
| PM-1.3-05 | Configuration Item Identification List              | 1          | U/AR                       | 2   |                                | And the second s | 11                      | 4    | 1 |       | 5                             |
| PM-1.3-06 | External Independent Readiness Review/<br>Red Teams | I          |                            | Prior to Launch<br>of GOES-N                    | Prior to L<br>of GOES          |  | 11                      | 4    | l | 20    | 25                            |
|           |   |            |                            |   |                                |  |                         |      |   |       |                               |
|           |   |            |                            |   |                                |  |                         |      |   |       |                               |
|           |   |            |                            | •   |                                |  |                         |      |   |       |                               |

| 3. 30 days after Contract Award  A/I - Approval/Information   | 6. Spacecraft Pre-Ship Review  U/AR - Update as Required                  | 9. HC | Procedures (Data Pkg. 14 days prior) 13. Once Per Launch Vehicle Design  * - Review Copies |
|---|---|-------|--|
| Notes: 1. Contract Award 2. 75 days after Contract Start Date | <ul><li>4. 14 days prior to PDR</li><li>5. 14 days prior to CDR</li></ul> |       | 11. HC & EC 12. Standard Contractor Processes/   |







| DATA ITEM |  |   | SUBMISSION   |                          |       | of the data of Life  |      |   | RD CO<br>T. CO |    | TOTAL |
|-----------|--|---|--------------|--------------------------|-------|--|------|---|----------------|----|-------|
|           | TITLE A/I FREQ INITIAL SUBSEC                      |   | SUBSEQ       | JENT                     | MEDIA | Α  | В    | С | HARD<br>COPIES |    |       |
|           | SYSTEM ENGINEERING                                 |   |              |                          | ,     | Contract of the Contract of th |      | - |                |    |       |
| SE-2.1-01 | System Concept Review Data Package                 | j |              | 14 days prior<br>to SCR  |       | on-water or the control of the contr | 11   | 4 | 1              | 20 | 25    |
| SE-2.1-02 | Preliminary Design Review Data Package             | I |              | 4                        |       | - ) since precinition of the   | 11   | 4 | ı              | 20 | 25    |
| SE-2.1-03 | Critical Design Review Data Package                | I |              | 5                        |       | and the state of t | 11   | 4 | 1              | 20 | 25    |
| SE-2.1-04 | Mission Operations Review Data Package             | I |              | 14 days prior to<br>MOR  |       | No. of the control of | 11   | 4 | 1              | 20 | 25    |
| SE-2.1-05 | Pre-Environmental Review Data Package              | I |              | 14 days prior to PER     |       | And the state of t | 11   | 4 | 1.             | 20 | 25    |
| SE-2.1-06 | Pre-Shipment Review Data Package                   | 1 |              | 14 days prior to PSR     |       |  | 11   | 4 | 1              | 20 | 25    |
| SE-2.1-07 | Flight Operations Review Data Package              | 1 |              | 14 days prior to<br>FOR  |       | Consideration and the second   | 11   | 4 | 1              | 20 | 25    |
| SE-2.1-08 | Spacecraft Launch Readiness Review Data<br>Package | I |              | 14 days prior to LLR     |       |  | 11   | 4 | 1              | 20 | 25    |
| SE-2.1-09 | Pre-Storage Review (PSTR) Data Package             | I |              | 14 days prior to<br>PSTR |       | And the second s | 11   | 4 | 1              | 20 | 25    |
| SE-2.2-01 | GFE Instrument Interface Documentation             | 1 | U/AR         | 4                        | 5     | And the second s | 11   | 4 | 1              |    | 5     |
| SE-2.3-01 | System Requirements Traceability Database          | I | U/AR         | 4                        | 5     | on the control of the | 11   | 4 | ı              |    | 5     |
| SE-2.4-01 | Performance Verification Plan                      | A | U/AR         | Proposal                 | 4, 5  | and the second of the second of  | - 11 | 4 | 1              |    | 5     |
| SE-2.4-02 | Performance Verification Specification             | ı | U/ <b>AR</b> | 4                        | 5     |  | 11   | 4 | 1              |    | 5     |
| SE-2.4-03 | Spacecraft Design Specification                    | 1 | U/AR         | 4                        | 5     |  | 11   | 4 | ì              |    | 5     |

| A/I - Approval/Information   | U/AR - Update as Required   | HC/EC - Hardcopy/Electronic copy | * - Review Copies  |
|--|---|----------------------------------|--|
| Notes: 1. Contract Award 2. 75 days after Contract Start Date. 3. 30 days after Contract Award | 4. 14 days prior to PDR 5. 14 days prior to CDR 6. Spacecraft Pre-Ship Review | 8. Subsystem CDR<br>9. HC        | 11. HC & EC 12. Standard Contractor Processes/ Procedures (Data Pkg. 14 days prior) 13. Once Per Launch Vehicle Design |







CCR 4353C, Mod85

| DATA ITEM    |  |     | SUBMISSION |                                  |  |                |   | RD C |   | TOTAL          |
|--------------|--|-----|------------|----------------------------------|--|----------------|---|------|---|----------------|
| 221171111111 | TITLE  | A/I | FREQ       | INITIAL                          | SUBSEQUENT                               | MEDIA          | A | В    | С | HARD<br>COPIES |
|              | SYSTEMS ENGINEERING (Cont)                           |     |            |                                  |  |                |   |      |   |                |
| SE-2.4-10    | Systems Verification Review                          |     |            |                                  |  |                |   |      |   |                |
| SE-2.4-11    | INR System Verification Review (SVR) Data<br>Package |     |            |                                  |  |                |   |      |   |                |
| SE-2.5-01    | ESD/SEU Prevention Plan                              | I   | U/AR       | 4                                | 5  | 11             | 4 | 1    |   | 5              |
| SE-2.5-02    | Field-of-View Analysis                               | I   | U/AR       | 4                                | 5  | 11             | 4 | 1    |   | 5              |
| SE-2.5-03    | EMC/EMI Compatibility Plan                           | I   | U/AR       | 4                                | 5  | 11             | 4 | 1    |   | 5              |
| SE-2.5-04    | Schematics & Block Diagrams                          | I   | U/AR       | 4                                | 5  | 11             | 4 | 1    |   | 5              |
| SE-2.5-05    | Debris Generation Analysis Report                    | 1   |            | 4                                | 5 - S/C section<br>1/00 - L/V<br>section | 11             | 4 | I    |   | 5              |
| SE-2.5-06    | Radiation Shielding and Dose Analysis Report         | 1   | U/AR       | 4                                | 5  | 11             | 4 | 1    |   | 5              |
| SE-2.5-07    | Extended Life Analysis (8 operations/2 storage)      | I   | U/AR       | 1 Year prior to launch of GOES N | 9 months prior to<br>launch of GOES<br>N |                | 2 | 2    |   | 6              |
|              | SPACECRAFT MANAGEMENT                                |     |            |                                  |  |                |   |      |   | -              |
| SM-3.1.1-01  | Spacecraft Photographs/Videos                        | I   |            | As Taken for<br>GOES-N           | Photos/Videos<br>req'd for<br>GOES-O/Q   | Film,<br>Photo | 2 |      |   | 2 ea.          |
| SM-3.1.1-02  | Mass Properties Report                               | 1   | Quarterly  | SCR                              | Subsequent S/C<br>Reviews                | 11             | 4 | 1    |   | 5              |

| Notes: 1. Contract Award 2. 75 days after Contract Start 3. 30 days after Contract Awa |                           | 7. Subsystem PDR 8. Subsystem CDR 9. HC 10. EC | 11. HC & EC 12. Standard Contractor Processes/ Procedures (Data Pkg. 14 days prior) 13. Once Per Launch Vehicle Design |
|--|---------------------------|--|--|
| A/I - Approval/Information   | U/AR - Update as Required | HC/EC - Hardcopy/Electronic copy               | * - Review Copies  |







|               | Table 1 Contrac  | et D | ata Requi | rement List             |                           |                         |    |   |       |                |
|---------------|--|------|-----------|-------------------------|---------------------------|-------------------------|----|---|-------|----------------|
| DATA ITEM     | DATA ITEM SUBMISSION   |      |           | N                       |                           | HARD COPY<br>DIST. CODE |    |   | TOTAL |                |
| D/11/11 TI EW | TITLE  | A/I  | FREQ      | INITIAL                 | SUBSEQUENT                | MEDIA                   | Α  | В | С     | HARD<br>COPIES |
| SM-3.1.1-03   | Power Profile Report   | I    | Quarterly | SCR                     | Subsequent S/C<br>Reviews | 11                      | 4  | 1 |       | 5              |
|               | SUBSYSTEM DESIGN & ANALYSIS                                      |      |           |                         | and the second of         |                         |    |   |       |                |
| SDA-3.2.1-01  | Component and Subsystem Design Specifications                    | I    | U/AR      | 4                       | 5                         | 11                      | 4  | 1 |       | 5              |
| SDA-3.2.1-02  | Subsystem & Component Design Review Data<br>Package              | I    |           | 7                       | 8                         | 11                      | 4* | 1 | 10    | 15             |
| SDA-3.2.2-01  | Structural & Mechanical Subsystem Performance<br>Analysis Report | I    | U/AR      | 4                       | 8                         | 11                      | 4  | i |       | 5              |
| SDA-3.2.2-02  | Structural & Dynamic Models and Model<br>Verification Plan       | I    | U/AR      | 4                       | 8                         | 11                      | 4  | 1 |       | 5              |
| SDA-3.2.2-03  | Stress Analysis  | l    | U/AR      | 4                       | 8                         | 11                      | 4  | ı |       | 5              |
| SDA-3.2.2-04  | Thermal Distortion Models and Model<br>Verification Plan         | I    | U/AR      | 21 days prior to<br>PDR | 21 days prior to<br>CDR   | 11                      | 4  | 1 |       | 5              |
| SDA-3.2.3-01  | Propulsion Subsystem Performance Analysis<br>Report              | I    | U/AR      | 7                       | 8                         | 11                      | 4  | 1 |       | 5              |
| SDA-3.2.4-01  | Attitude Control Subsystem (ACS) Performance<br>Analysis Report  | I    | U/AR      | 7                       | 8                         | 11                      | 4  | 1 |       | 5              |
| SDA-3.2.4-02  | Attitude Control Subsystem (ACS) Detail<br>Description           | I    | U/AR      | 7                       | 8                         | 11                      | 15 | 1 |       | 16             |

| A/I - Approval/Information  | U/AR - Update as Required   | 9. HC<br>10. EC<br>HC/EC - Hardcopy/Electronic copy | Procedures (Data Pkg. 14 days prior)  13. Once Per Launch Vehicle Design  * - Review Copies |
|---|---|---|---|
| Notes: 1. Contract Award 2. 75 days after Contract Start Date 3. 30 days after Contract Award | 4. 14 days prior to PDR 5. 14 days prior to CDR 6. Spacecraft Pre-Ship Review | 7. Subsystem PDR<br>8. Subsystem CDR                | 11. HC & EC<br>12. Standard Contractor Processes/   |







|               | Tubic 1 Contrac  |            | ata Itoquii | CINCIL LIST                        |           |                         |       |   |               |    |        |
|---------------|--|------------|-------------|------------------------------------|-----------|-------------------------|-------|---|---------------|----|--------|
| DATA ITEM     |  | SUBMISSION |             |                                    |           | HARD COPY<br>DIST. CODE |       |   | TOTAL<br>HARD |    |        |
| DAIATIEM      | TITLE  | A/I        | FREQ        | INITIAL                            | SUBSEQ    | UENT                    | MEDIA | Α | В             | С  | COPIES |
|               | SUBSYSTEM DESIGN & ANALYSIS (cont)                               |            |             |                                    |           |                         |       |   |               |    |        |
| SDA-3.2.5-01  | Thermal Subsystem Performance Analysis Report                    | I          | U/AR        | 4                                  | 8         |                         | 11    | 4 | 1             |    | 5      |
| SDA-3.2.5-02  | Thermal Math Models  | l          | U/AR        | 4                                  | 8         |                         | 11    | 2 |               |    | 2      |
| SDA-3.2.6-01  | Power Subsystem Analysis Report                                  | l          | U/AR        | 7                                  | 8         |                         | 11    | 4 | ı             |    | 5      |
| SDA-3.2.8-01  | Communications Subsystem Performance<br>Analysis Report          | I          | U/AR        | 4                                  | 8         |                         | 11    | 4 | 1             |    | 5      |
| SDA-3.2.8-02  | Communications Subsystem Component<br>Computer Simulation Models |            | U/AR        | 4                                  | 8         |                         | 11    | 3 |               |    | 3      |
| SDA-3.2.9-01  | Telemetry & Command Performance Analysis                         | ı          | U/AR        | 4                                  | 8         |                         | 11    | 4 | 1             |    | 5      |
| SDA-3.2.9-02  | Telemetry & Command Handbook                                     | I          | U/AR        | 5, 6,7<br>for GOES-N               | Updated t |                         | 11    | 4 | 1             |    | 5      |
| SDA-3.2.9-03  | Command Encryptor M&O Manual and Interface Description Document  | I          | U/AR        | 8                                  | ١         |                         | 11    | 4 | ı             |    | 5      |
| SDA-3.2.10-01 | Mechanisms Performance Analysis Report                           | I          | U/AR        | 4                                  | 5         |                         | 11.   | 4 | 1             |    | 5      |
| SDA-3.2.12-01 | Software Requirements Specification                              | Į          | U/AR        | Software<br>Requirements<br>Review | 7, 8      | 3                       | 11    | 4 | 1             | 20 | 25     |
|               |  |            |             |                                    |           |                         |       |   |               |    |        |
|               |  |            |             |                                    |           |                         |       |   |               |    |        |
|               |  |            |             |                                    |           |                         |       |   | L             |    | i      |

| A/I - Approval/Information  | U/AR - Update as Required   | HC/EC - Hardcopy/Electronic copy        | 13. Once Per Launch Vehicle Design  * - Review Copies                               |
|---|---|---|---|
| Notes: 1. Contract Award 2. 75 days after Contract Start Date 3. 30 days after Contract Award | 4. 14 days prior to PDR 5. 14 days prior to CDR 6. Spacecraft Pre-Ship Review | 7. Subsystem PDR 8. Subsystem CDR 9. HC | 11. HC & EC 12. Standard Contractor Processes/ Procedures (Data Pkg. 14 days prior) |



SDA-3.2.12-10 | Electrical Power & Distribution Subsystem

Algorithms Document





5

#### Table 1 **Contract Data Requirement List** HARD COPY **SUBMISSION** DIST. CODE TOTAL **DATA ITEM** HARD TITLE SUBSEQUENT C COPIES A/I **FREQ** INITIAL MEDIA Α В SUBSYSTEM DESIGN & ANALYSIS (cont) SDA-3.2.12-02 Software Design Document U/AR Software PDR a) 8 20 11 25 b) Software CDR + 90 days c) Conclusion of software testing d) Final @ PSR SDA-3.2.12-03 Software Test Plan 7 U/AR 11 5 Software Test Procedures SDA-3.2.12-04 8(Prelim) Software Test 11 5 Readiness + 60 days SDA-3.2.12-05 Software Test Report Final copy at 11 5 conclusion of software formal qualification (acceptance) testing SDA-3.2.12-06 (deleted) SDA-3.2.12-07 Software User & Maintenance Manual U/AR Prelim: Completion Final: S/C PSR 11 5 of software testing SDA-3.2.12-08 (deleted) SDA-3.2.12-09 Attitude Control Subsystem Algorithms U/AR 7 11 5 Document

| 75 days after Contract Start Date     3. 30 days after Contract Award | 4. 14 days prior to PDR 5. 14 days prior to CDR 6. Spacecraft Pre-Ship Review | 7. Subsystem PDR 8. Subsystem CDR 9. HC 10. EC | 11. HC & EC 12. Standard Contractor Processes/ Procedures (Data Pkg. 14 days prior) 13. Once Per Launch Vehicle Design |
|---|---|--|--|
| A/I - Approval/Information  | U/AR - Update as Required   | HC/EC - Hardcopy/Electronic copy               | * - Review Copies  |

U/AR

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| Table I Contract Data Reduirement Lis | Table 1 | Contract Data Requiremen | t List |
|---------------------------------------|---------|--------------------------|--------|
|---------------------------------------|---------|--------------------------|--------|

|               |   | <del>,                                     </del> |      | · · · · · · · · · · · · · · · · · · · |  |       |                         |       |        | <del>,</del>  |
|---------------|---|---|------|---------------------------------------|--|-------|-------------------------|-------|--------|---------------|
| DATA ITEM     |   |   |      | SUBMISSIC                             | N  |       | HARD COPY<br>DIST. CODE |       |        | TOTAL<br>HARD |
| BITTITEN      | TITLE   | A/I   | FREQ | INITIAL                               | SUBSEQUENT   | MEDIA | A                       | A B C | COPIES |               |
|               | SUBSYSTEM DESIGN & ANALYSIS (cont)                                      |   |      |                                       | and the second   |       |                         |       |        |               |
| SDA-3.2.12-11 | Flight Computer Design Description                                      | I   | U/AR | 4                                     | 5  | 11    | 4                       | 1     |        | 5             |
| SDA-3.2.12-12 | Software Management, Development, and Assurance Plan (SMDAP)            | I   | U/AR | Proposal                              | Software<br>Requirements<br>Review   | 11    | 4                       | 1     | 20     | 15            |
| SDA-3.2.13-01 | Spacecraft Emulator Design Document                                     | I   | U/AR | Emulator<br>Maintenance<br>Training   | Prelim: Delivery<br>of S/C Emulator<br>Final: Emulator<br>handover to the<br>government        | 11    | 4                       | 1     | 20     | 25            |
| SDA-3.2.13-02 | Spacecraft Emulator User's Operations and Maintenance Manual            | I   | U/AR | Emulator<br>delivery                  | Prel: at Emulator<br>maintenance<br>training<br>Final: at Emulator<br>handover to the<br>gov't | 11    | 4                       | 1     |        | 5             |
| SDA-3.2.14-01 | SEM Data & Calibration Handbook   | I   | U/AR | 5, 6<br>for GOES-N                    | Updated for each s/c   | 11    | 4                       | 1     |        | 5             |
| SDA-3.2.14-02 | Spacecraft Magnetic Control Plan for Magnetometer Performance Assurance | I   | U/AR | 4, 5<br>for GOES-N                    | Updated for each s/c   | 11    | 4                       | 1     |        | 5             |
| SDA-3.2.14-03 | SXI Pointing & Jitter Analysis  | ı   | U/AR | 4                                     | 5  | 11    | 4                       | 1     |        | 5             |
| SDA-3.2.16-01 | INR System Description and Analysis Document                            | I   | U/AR | Proposal                              | 14 days prior to<br>PDR<br>21 days prior to<br>CDR<br>21 days prior to<br>PSR                  | 11    | 4                       | 1     | 30     | 35            |

| 75 days after Contract Start Date     3. 30 days after Contract Award | 4. 14 days prior to PDR 5. 14 days prior to CDR 6. Spacecraft Pre-Ship Review | 8. Subsystem CDR<br>9. HC        | 11. HC & EC 12. Standard Contractor Processes/ Procedures (Data Pkg. 14 days prior) 13. Once Per Launch Vehicle Design |
|---|---|----------------------------------|--|
| A/I - Approval/Information  | U/AR - Update as Required   | HC/EC - Hardcopy/Electronic copy | * - Review Copies  |







## Table 1 Contract Data Requirement List

| DATA ITEM     |  |   |             | SUBMISSIO                                 | N  |       | HARD COPY<br>DIST. CODE |   |   | TOTAL<br>HARD |
|---------------|--|---|-------------|---|--|-------|-------------------------|---|---|---------------|
| DATATIEM      | TITLE                                      |   | FREQ        | INITIAL                                   | SUBSEQUENT                                 | MEDIA | A                       | В | C |               |
| SDA-3.2.16-02 | INR Related System Performance Report      | I | U/AR        | 4   | 8  | 11    | 4                       | 1 |   | 5             |
| SDA-3.2.17-01 | Contamination Control Plan                 | I | U/AR        | Proposal                                  | 4, 5                                       | 11    | 4                       | 1 |   | 5             |
| <u>-</u>      | SUBSYSTEM FABRICATION, ASSEMBLY & TEST     |   |             |   |  |       |                         |   |   |               |
| SFAT-3.3.1-01 | Component and Subsystem Test Procedures    | 1 | U/AR        | 30 days prior to use                      | U/AR                                       | 11    | 3                       | l |   | 4             |
| SFAT-3.3.1-02 | Component and Subsystem Test Data Packages | I | U/AR        |   |  | 9     |                         | l |   | 1             |
|               | •  |   |             |   |  |       |                         |   |   |               |
|               | INTEGRATION AND TEST                       |   |             |   |  |       |                         |   |   |               |
| I&T-3.4.4-01  | Spacecraft Test Procedures                 | I | U/AR        | 30 days prior to use                      | U/AR                                       | 11    | 3                       | 1 |   | 4             |
| I&T-3.4.4-02  | Spacecraft Test Data Package               | I |             | Following<br>GOES-N S/C<br>I & T Activity | Following GOES-<br>O/Q S/C l&T<br>activity | 11    |                         | 1 |   | I             |
| I&T-3.4.4-03  | Performance Verification Reports           | 1 |             | 30 days after<br>GOES-N test<br>activity  | 30 days after<br>GOES-O/Q l&T<br>activity  | 11    | 4                       | 1 |   | 5             |
| I&T-3.4.6-01  | Launch Site Integration Plan               | l | Per Mission | 4, 5, interim<br>@ L-12 mo.               | U/AR5<br>Final @ L-3 mo                    | 11    | 4                       | l |   | 5             |
| I&T-3.4.6-02  | Launch Commit Criteria                     | I | Per Mission | 5,<br>interim at PER                      | Final @ L-3 mo.                            | 11    | 4                       | 1 |   | 5             |

| A/I - Approval/Information  | U/AR - Update as Required   | HC/EC - Hardcopy/Electronic copy        | 13. Once Per Launch Vehicle Design  * - Review Copies                               |
|---|---|---|---|
| Notes: 1. Contract Award 2. 75 days after Contract Start Date 3. 30 days after Contract Award | 4. 14 days prior to PDR 5. 14 days prior to CDR 6. Spacecraft Pre-Ship Review | 7. Subsystem PDR 8. Subsystem CDR 9. HC | 11. HC & EC 12. Standard Contractor Processes/ Procedures (Data Pkg. 14 days prior) |







# Table 1 Contract Data Requirement List

|               |  |     |             | SUBMISSIO                         | N                                 | more on pond Approximately   |       |   | D CC<br>r. co |   | TOTAL<br>HARD |
|---------------|--|-----|-------------|-----------------------------------|-----------------------------------|--|-------|---|---------------|---|---------------|
| DATA ITEM     | TITLE  | A/I | FREQ        | INITIAL                           | SUBSEQ                            | UENT   | MEDIA | Α | В             | С | COPIES        |
| I&T-3.4.6-03  | Launch Site Test Procedures  | A   | Per Mission | 60 days prior to PSR              | - U/Al                            | R  | 11    | 3 | l             |   | 4             |
| I&T-3.4.6-04  | Ground Operations Plan   | A   |             | 45 days prior to<br>PDR           | a) 45 days<br>to CD<br>b) final ( | R<br>@ L-3   | 11    | 3 | 1             |   | . 4           |
| I&T-3.4.6-05  | Missile System Pre-Launch Safety Package                                   | A   | Per Mission | 45 days prior to<br>PDR           | a) 45 day<br>to CD<br>b) final (  | )R<br>@ L-3  | 11    | 3 | 1             |   | 4             |
| I&T-3.4.9-01  | Transportation & Handling Plan & Procedures                                | I   | U/AR        | 5, interim @<br>L-12 mo.          | Final @ L                         | -3 mo.   | 11    | 4 | 1             |   | 5             |
| I&T-3.4.10-01 | Ground Storage Plan -  | I   | U/AR        | 5                                 | 6                                 | A MANAGEMENT AND PROPERTY OF THE   | 11    | 4 | l             |   | 5             |
| I&T-3.4.11-01 | Assembly, Integration and Test Personnel Ground<br>System Training Package | I   | U/AR        | 90 days after launch<br>of GOES N | GOES N<br>Accept                  | 1  | 11    | 2 | 2             |   | 4             |
| I&T-3.4.11-02 | Spacecraft System Post-Storage Integration and Test Training Documentation | I   | U/AR        | 90 days after launch<br>of GOES N | GOES N<br>Accept                  | 1  | 11    | 2 | 2             |   | 4             |
| I&T-3.4.11-03 | Spacecraft Thermal Vacuum (SCTV) Test<br>Training Documentation            | l   | U/AR        | 90 days after launch<br>of GOES N | GOES N<br>Accept                  | 3 '  | 11    | 2 | 2             |   | 4             |
| I&T-3.4.11-04 | Instrument Test and STE Training Documentation                             | I   | U/AR        | 90 days after launch<br>of GOES N | GOES N<br>Accept                  | 3  | 11    | 2 | 2             |   | 4             |
|               |  |     |             |                                   |                                   | e investigation of the state of |       |   |               |   |               |
|               |  |     |             |                                   |                                   |  |       |   |               |   |               |

| A/I - Approval/Information  | U/AR - Update as Required   | HC/EC - Hardcopy/Electronic copy               | * - Review Copies  |
|---|---|--|--|
| Notes: 1. Contract Award 2. 75 days after Contract Start Date 3. 30 days after Contract Award | 4. 14 days prior to PDR 5. 14 days prior to CDR 6. Spacecraft Pre-Ship Review | 7. Subsystem PDR 8. Subsystem CDR 9. HC 10. EC | 11. HC & EC 12. Standard Contractor Processes/ Procedures (Data Pkg. 14 days prior) 13. Once Per Launch Vehicle Design |







### Table 1 Contract Data Requirement List

| DATA ITEM    |  |     |      | SUBMISSIO  | N  |   |       |   | RD CC |   | TOTAL          |
|--------------|--|-----|------|--|--|---|-------|---|-------|---|----------------|
| DATA TIENT   | TITLE  | A/I | FREQ | INITIAL  | SUBSEQ   | JENT  | MEDIA | Α | В     | С | HARD<br>COPIES |
|              | SPACECRAFT SUPPORT GROUND<br>SYSTEM MODIFICATIONS  |     |      |  | ***************************************  |   |       |   |       |   | ·              |
| GND-3.5.2-01 | Telemetry and Command System (GTACS) Design and Implementation                           | 1   | U/AR | Item 1,3b:4 Item 2,3a:5 Item 3c:Preship test - 4 mo. Item 3d: Post ship test - 4 mo. Item 4c,d: Shipment - 3 mo. Item 3e: PAT -4 mo. Item 3g: Compat test - 4 mo Item 4a: 5 Item 4b: training - 6 mo. Item 3f: Integ. Gnd Sys Test - 4 mo. Item 3h: Launch - 6 mo. | Item 1,3 Item 3 CDR + 2 Item 3c: P test - 2 i Item 2: Pr review - 2 Item 3d: ship test - Item 4c Shipment Item 3 PAT - 2 Item 3g: C test - 2 i Item 4a training - Item 3f: I Gnd Sys - 2 m | a: mo. reship mo. Post 2 mo. , d: - 1 mo e: mo. ompat no. , b: 4 mo. nteg. Test | 11    | 4 | 1     |   | 5              |
|              |  |     |      | Post Test Analysis<br>for 3c - 3h:<br>Test + 2 mo.   | Item 3<br>Launch –   |   |       |   |       | - |                |
| GND-3.5.2-02 | Telemetry Acquisition and Command Transmission System (NTACTS) Design and Implementation |     |      | Item 1,3b:4 Item 2,3a:5 Item 3c: Preship test - 4 mo. Item 3d: Post ship test - 4 mo. Item 4c,d: Shipment - 3 mo. Item 3e: PAT - 4 mo. Item 3g: Compat   | Item 1,3<br>Item 3<br>CDR + 2<br>Item 3c: Pi<br>test - 2 r<br>Item 2: Pi<br>review - 2<br>Item 3d:<br>ship test -<br>Item 4c<br>Shipment -   | a:<br>mo.<br>reship<br>no.<br>eship<br>mo.<br>Post<br>2 mo.<br>,d:              |       | 4 |       |   | 5              |

| 75 days after Contract Start Date     3. 30 days after Contract Award | 4. 14 days prior to PDR 5. 14 days prior to CDR 6. Spacecraft Pre-Ship Review | 9. HC                            | 11. HC & EC 12. Standard Contractor Processes/ Procedures (Data Pkg. 14 days prior) 13. Once Per Launch Vehicle Design |
|---|---|----------------------------------|--|
| A/I - Approval/Information  | U/AR - Update as Required   | HC/EC - Hardcopy/Electronic copy | * - Review Copies  |







### Table 1 Contract Data Requirement List

|              | Table 1 Contrac   | l D | ata Kequii | ement List   |  |  | × 47  |          |                |   |               |
|--------------|---|-----|------------|--|--|--|-------|----------|----------------|---|---------------|
|              |   |     |            | SUBMISSIO  | N .  |  |       |          | ED CC<br>T. CO |   | TOTAL<br>HARD |
| DATA ITEM    | TITLE   | A/I | FREQ       | INITIAL  | SUBSEQU  | JENT   | MEDIA | A        | В              | С | COPIES        |
| -            | -   |     |            | test - 4 mo. Item 4a: 5 Item 4b: training - 6 mo. Item 3f: Integ. Gnd Sys Test - 4 mo. Item 3h: Launch - 6 mo. Post Test Analysis for 3c - 3h: test + 2 mo.  | Item 3 PAT - 2 Item 3g: C test - 2 t Item 4a training - Item 3f: It Gnd Sys - 2 me Item 3 Launch - 4   | mo. compat mo. cb: d mo. nteg. Test c). h: mo.   |       |          |                |   |               |
| GND-3.5.2-03 | Orbit and Attitude Tracking System (OATS) Design and Implementation | I   | U/AR       | Item 1, 3b:4 Item 2, 3a: 5 Item 3c: Preship test - 4 mo. Item 3 d: Post ship test - 4 mo. Item 4c,d: Shipment - 3 mo. Item 3e: PAT - 4 mo. Item 3g: Compat test - 4 mo. Item 4a: 5 Item 4b: training - 6 mo. Item 3f: Integ. Gnd Sys Test - 4 mo. Item 3h: Launch - 6 mo.  Post Test Analysis for 3c - 3h: test + 2 mo | Item 1, 3 Item 3 CDR + 2 Item 3c: Pi test - 2 r Item 3d: ship test - Item 4c Shipment - Item 3g: C Item 3g: C Item 4a training - Item 3f: I Gnd Sys - 2 mc Item 3 Launch - 4 | a: mo. reship no. eship mo. Post 2 mo. d: 1 mo. e: mo. compat mo. b: 4 mo. nteg. Test b. | 11    | 4        | 1              |   | 5             |
|              |   |     |            |  |  |  |       |          |                |   |               |
|              |   |     | L          | 1  | L  |  | LJ    | <u> </u> | 1              | 1 |               |

| A/I - Approval/Information  | U/AR - Update as Required   | HC/EC - Hardcopy/Electronic copy               | * - Review Copies  |
|---|---|--|--|
| Notes: 1. Contract Award 2. 75 days after Contract Start Date 3. 30 days after Contract Award | 4. 14 days prior to PDR 5. 14 days prior to CDR 6. Spacecraft Pre-Ship Review | 7. Subsystem PDR 8. Subsystem CDR 9. HC 10. EC | 11. HC & EC 12. Standard Contractor Processes/ Procedures (Data Pkg. 14 days prior) 13. Once Per Launch Vehicle Design |



A/l - Approval/Information





|               | Table 1 Contract  | T Da       | ita Kequ | irement List   |  |   | НА           | RD C    | OPY           |        |
|---------------|---|------------|----------|--|--|---|--------------|---------|---------------|--------|
| DATA ITEM     |   | SUBMISSION |          |  |  |   | •            | T. CC   | TOTAL<br>HARD |        |
| CNID 2 5 2 04 |   | A/I        | FREQ     | INITIAL  | SUBSEQUE   |   | <del> </del> | В       | C             | COPIES |
| GND-3.5.2-04  | MDL Receive System & Archive (MRS&A) Design and Implementation  |            | U/AR     | Item 1,3b:4 Item 2, 3a: 5 Item 3c: Preship test - 4 mo. Item 3d: Post ship test - 4 mo. Item 4c,d: Shipment - 3 mo. Item 3e: PAT - 4 mo. Item 3g: Compat test - 4 mo. Item 4a: 5 Item 4b: training - 6 mo. Item 3f: Integ. Gnd Sys Test - 4 mo. Item 3h: Launch - 6 mo. Post Test Analysis for 3c - 3h: test + 2 mo. | Item 1,3b:5 Item 3a: CDR + 2 mo Item 3c: Presl test - 2 mo. Item 2: Presh review - 2 m Item 3d: Pos ship test - 2 n Item 4c,d: Shipment - 1 r Item 3g: Com test - 2 mo. Item 3g: Com test - 2 mo. Item 3f: Integ Gnd Sys Tes - 2 mo. Item 3h: Launch - 4 m | ip<br>o.<br>t<br>io.<br>no.                             | 4            | 1       |               | 5      |
| GND-3.5.2-05  | Spacecraft Support Ground System (SSGS) Interface Specification   | I          | U/AR     | 4  | 5  | 11  | 4            | 1       |               | 5      |
| GND-3.5.2-06  | Dynamic Interaction Diagnostic (DID) Design and Implementation  | I          | U/AR     | Item 1,3b:4 Item 2, 3a:5 Item 3c: Preship test - 4 mo. Item 3d: Post ship test - 4 mo. Item 4c,d: Shipment - 3 mo. Item 3e: PAT - 4 mo. Item 3g: Compat test - 4 mo.   | Item 1,3b:5 Item 3a: CDR + 2 mo Item 3c: Presh test - 2 mo. Item 2: Preshi review - 2 mo. Item 3d: Pos ship test - 2 m Item 4c;d: Shipment -   1 n Item 3e:  | ip<br>p<br>o.   | 4            | 1       |               | 5      |
| 2. 75 da      | act Award  4. 14 days prior to PDR ys after Contract Start Date 5. 14 days prior to CDR ys after Contract Award 6. Spacecraft Pre-Ship Revi | iew        |          | 7. Subsystem PDR<br>8. Subsystem CDR<br>9. HC<br>10. EC  | 11<br>  12<br>  Pro  | HC & EC<br>Standard Co<br>ocedures (Data<br>Once Per La | a Pkg. 1     | l 4 day | s prior       |        |

HC/EC - Hardcopy/Electronic copy

\* - Review Copies

U/AR - Update as Required







| DATA ITEM  |  |     | SUBMISSION |  |  |       |    | RD CC | TOTAL |                |
|--|--|-----|------------|--|--|-------|----|-------|-------|----------------|
| OPS-3.6.1-02 SOPS-3.6.1-03 SOPS-3.6.2-01 SOPS-3.6.2-02 SOP | TITLE  | A/I | FREQ       | INITIAL  | SUBSEQUENT   | MEDIA | A  | В     | С     | HARD<br>COPIES |
| -<br>-   | -  |     |            | Item 4a:5 Item 4b: training - 6 mo. Item 3f: Integ Gnd Sys Test - 4 mo. Item 3h: Launch - 6 mo. Post Test Analysis for 3c - 3h: test + 2 mo. | PAT - 2 mo. Item 3g: Compat test - 2 mo. Item 4a,b: training - 4 mo. Item 3f: Integ. Gnd Sys Test - 2 mo. Item 3h: Launch - 4 mo.  |       |    |       |       |                |
|  | FLIGHT OPERATIONS                                  |     |            |  | To the state of th |       |    |       |       | _              |
| OPS-3.6.1-01   | Spacecraft Operations Handbooks                    | A   | U/AR       | 15 months prior<br>to launch of GOES-<br>N   | 60 days after receipt of GSFC comments   | 11    | 25 | ı     |       | 26             |
| OPS-3.6.1-02   | Spacecraft Training Program Plan                   | I   |            | 15 months prior<br>to launch of GOES-<br>N   | 60 days after<br>receipt of GSFC<br>comments   | 11    | 4  | 1     |       | 5              |
| OPS-3.6.1-03   | Spacecraft Mission Operations Plan                 | I   |            | 12 Months<br>before launch<br>of GOES-N  | 12 Months<br>before launch of<br>GOES O, P, Q  | 11    | 4  | 1     |       | 5              |
| OPS-3.6.2-01   | Spacecraft On-Orbit Storage Plan                   | I   |            | 5  | 6  | 11    | 4  | I     |       | 5              |
| OPS-3.6.2-02   | Spacecraft De-orbit Plan                           | ı   |            | 4  | 5  | 11    | 4  | 1     |       | 5              |
| OPS-3.6.3-01   | Spacecraft Engineering Handover Review             | I   |            | 21 days after launch<br>of<br>GOES-N   | 21 days after<br>launch of<br>GOES-O,P,Q   | 11*   | 4  | 1     | 20    | 25             |
| OPS-3.6.3-02   | Spacecraft Launch and Orbit Raising Data<br>Review | I   |            | 2 Months after<br>GOES-N<br>launch   | 2 Months after<br>GOES O,P,Q<br>Launch   | 11*   | 4  | 1     | 20    | 25             |

| Notes: 1. Contract Award 2. 75 days after Contract Start Date 3. 30 days after Contract Award | 4. 14 days prior to PDR 5. 14 days prior to CDR 6. Spacecraft Pre-Ship Review | 7. Subsystem PDR 8. Subsystem CDR 9. HC 10. EC | 11. HC & EC 12. Standard Contractor Processes/ Procedures (Data Pkg. 14 days prior) 13. Once Per Launch Vehicle Design |
|---|---|--|--|
| A/I - Approval/Information  | U/AR - Update as Required   | HC/EC - Hardcopy/Electronic copy               | * - Review Copies  |







# Table 1 Contract Data Requirement List

|              |   | سبب | <u> </u>     |                                      |  |          |     |       |   |                |
|--------------|---|-----|--------------|--------------------------------------|--|----------|-----|-------|---|----------------|
| DATA ITEM    |   |     |              | SUBMISSIO                            | N  |          |     | RD CO |   | TOTAL<br>HARD  |
| BATATIEN     | TITLE   | A/I | FREQ         | INITIAL                              | SUBSEQUE   | NT MEDIA | . A | В     | С | HARD<br>COPIES |
| OPS-3.6.4-01 | Database Update and Delivery Process Training Documentation | I   | U/AR         | 30 days prior to<br>launch of GOES N | GOES N Fi<br>Acceptance  |          | 2   | 2     |   | 4              |
| OPS-3.6.4-02 | Console Manual and PROC Training Documentation              | I   | U/AR         | 30 days prior to<br>launch of GOES N | GOES N Fi<br>Acceptance  |          | 2   | 2     |   | 4              |
| OPS-3.6.4-03 | ETE Test Training Documentation                             | I   | U/AR         | 30 days prior to<br>launch of GOES N | GOES N Fi<br>Acceptance  |          | 2   | 2     |   | 4              |
|              | PERFORMANCE ASSURANCE                                       |     |              |                                      |  |          |     |       |   |                |
| PA-3.7.1-01  | Not Assigned  |     |              |                                      | man Apply of any majories  |          |     |       |   |                |
| PA-3.7.1-02  | Previously Qualified Hardware and Software Report           | A   |              | 4                                    | 5  | . 11     | 4   | 1     |   | 5              |
| PA-3.7.1-03  | Safety Noncompliance Report                                 | Α   | As generated |                                      | TO THE RESERVE OF THE PERSON O | 11       | 2   | 1     |   | 3              |
| PA-3.7.1-04  | System Safety Program Plan                                  | A   | U/AR         | 4                                    | According to the second  | 11       | 2   | ı     |   | 3              |
| PA-3.7.1-05  | Operations Hazards Analysis                                 | A   | U/AR         | 4                                    | merchania Antonio Joseph   | 11       | 2   | 1     |   | 3              |
|              |   |     |              |                                      |  |          |     |       |   |                |
|              |   |     |              |                                      | Am against an ann an Amhaile an A |          |     |       |   |                |
|              |   |     |              |                                      | TO CONTRACTOR A CONTRACTOR AND A MERCANICAL PROPERTY.  |          |     |       |   |                |
|              |   |     |              |                                      | INVPRAME OPPOSABILITY AND  |          |     |       |   |                |
|              |   |     |              |                                      |  |          | ĺ   | 1     |   |                |

| Notes: 1. Contract Award 2. 75 days after Contract Start Date 3. 30 days after Contract Award | 4. 14 days prior to PDR 5. 14 days prior to CDR 6. Spacecraft Pre-Ship Review | 7. Subsystem PDR 8. Subsystem CDR 9. HC 10. EC | 11. HC & EC 12. Standard Contractor Processes/ Procedures (Data Pkg. 14 days prior) 13. Once Per Launch Vehicle Design |
|---|---|--|--|
| A/I - Approval/Information  | U/AR - Update as Required   | HC/EC - Hardcopy/Electronic copy               | * - Review Copies  |







# Table 1 Contract Data Requirement List

| DATA ITEM |  |     |                     | SUBMISSIO                       | N      | de Procourteschariterates age  |       |   | ED CC<br>T. CC |    | TOTAL          |
|-----------|--|-----|---------------------|---------------------------------|--------|--|-------|---|----------------|----|----------------|
| DATATIEM  | TITLE  | A/I | FREQ                | INITIAL                         | SUBSEQ | UENT   | MEDIA | A | В              | С  | HARD<br>COPIES |
|           | LAUNCH VEHICLE DATA<br>REQUIREMENTS  |     |                     |                                 |        |  |       |   |                |    |                |
| LV-3.8-01 | Spacecraft/Launch Vehicle Interface Control Document (ICD)                 | A   |                     | 5                               | U/A    | R  | 11    | 4 | 1              |    | 5              |
| LV-3.8-02 | Preliminary Mission Analysis (PMA) Report                                  | ı   | Once per mission    | L-12 months                     |        |  | 11    | 4 | 1              |    | 5              |
| LV-3.8-03 | Final Mission Analysis (FMA) Report  | I   | Once per mission    | L-6 months                      | U/A    | R  | 11    | 4 | 1              |    | 5              |
| LV-3.8-04 | Booster on Stand or Pre-Vehicle on Stand (Pre-<br>VOS) Review Data Package | I   | Once per mission    | 12                              |        | Action and the contract of the | 11    | 4 | 1              | 20 | 25             |
| LV-3.8-05 | Launch Vehicle Design Certification Review (DCR)                           | 1   | 13                  | NLT 3 months prior<br>to launch | U/A    | R  | 11    | 4 | 1              | 20 | 25             |
| LV-3.8-06 | Spacecraft/Launch Vehicle Interface<br>Requirements Document (IRD)         | A   |                     | 4                               | U/A    | R  | 11    | 4 | 1              |    | 5              |
| LV-3.8-07 | Mission Integration Program Kickoff Review                                 | I   | Once per<br>mission | 4                               |        | e adaption para la propieta de la propieta del la propieta de la propieta del la propieta de la propieta del la propieta de la propieta del la propieta del la propieta del la propieta del la propieta d | 11    | 4 | i              | 20 | 25             |
| LV-3.8-08 | Launch Services System Effectiveness (LSSE)<br>Program Plan                | I   |                     | 3                               | U/A    | R  | 11    | 4 | 1              |    | 5              |
| LV-3.8-09 | Launch Vehicle Requirements Review Data<br>Package                         | I   | 13                  | GOES-N<br>CDR -4 mos.           | U/A    | Remaining Property and the last of the las | 11    | 4 | 1              | 20 | 25             |
| LV-3.8-10 | Delta IV Launch System Training Data Package                               | I   | 13                  | . 12                            |        | A STATE OF THE STA | 11    | 4 | 1              | 20 | 25             |

| A/I - Ar | pproval/Information  | U/AR - Update as Required                             | HC/EC - Hardcopy/Electronic copy | 13. Once Per Launch Vehicle Design  * - Review Copies                      |
|----------|--|---|----------------------------------|--|
|          | <ul><li>2. 75 days after Contract Start Date</li><li>3. 30 days after Contract Award</li></ul> | 5. 14 days prior to CDR 6. Spacecraft Pre-Ship Review | 8. Subsystem CDR<br>9. HC        | 12. Standard Contractor Processes/<br>Procedures (Data Pkg. 14 days prior) |
| Notes:   | Contract Award   | 4. 14 days prior to PDR                               | 7. Subsystem PDR                 | 11. HC & EC  |







### Table 1 Contract Data Requirement List

| DATAITEM  |   |     |              | SUBMISSIO                                     | N      |      | ,     |   | D CC<br>T. CO | TOTAL<br>HARD |          |
|-----------|---|-----|--------------|---|--------|------|-------|---|---------------|---------------|----------|
| DATA ITEM | TITLE   | A/I | FREQ         | INITIAL                                       | SUBSEQ | JENT | MEDIA | Α | В             | С             | COPIES . |
| LV-3.8-11 | Mission Unique Design Review #1 Package                     | I   | 13           | L-12 months                                   |        |      | 11    | 4 | 1             | 20            | 25       |
| LV-3.8-12 | Mission Unique Design Review #2 Package                     | I   | 13           | NLT 3 months prior to launch                  | -      |      | 11    | 4 | 1             | 20            | 25       |
| LV-3.8-13 | Launch Vehicle Component and Subsystem Test<br>Procedures   | 1   |              | 30 Days Prior to Use                          | U/AI   | t    | 11    | 4 | l             |               | 10       |
| LV-3.8-14 | Launch Vehicle Component and Subsystem Test<br>Data Package | i   | As Generated | •   |        |      | 9     |   | 2             |               | 5        |
| LV-3.8-15 | Launch Vehicle Launch Site Integration Plan                 | i   | Per Mission  | Launch Site<br>Ops -2Months                   | U/AI   |      | 11    | 4 | 1             |               | 5        |
| LV-3.8-16 | Launch Vehicle Pre-Installation Reviews Data Package        | I   | Per Mission  | 12  |        |      | 11    | 4 | 1             | 20            | 25       |
| LV-3.8-17 | Final Loads Verification Review Data Package                | I   | Per Mission  | No Later Than<br>L -2 Months                  |        |      | 11    | 4 | 1             | 20            | 25       |
| LV-3.8-18 | Launch Vehicle Launch Site Test Procedures                  | 1   | Per Mission  | In Accordance with<br>EWR 127-1               | U/AR   |      | 11    | 4 | 1             |               | 10       |
| LV-3.8-19 | Integrated Spacecraft Handling Plan                         | J   | Per Mission  | No Later Than<br>Launch Site<br>Ops -2 Months | U/AF   |      | 11    | 4 | ı             |               | 10       |
| LV-3.8-20 | Launch Vehicle Pre-Shipment Review (PSR) Data Package       | l   | Per Mission  | 12  |        |      | 11    | 4 | 1             | 20            | 25       |
|           |   |     |              |   |        |      |       |   |               |               |          |

| Notes: 1. Contract Award 2. 75 days after Contract Start Date 3. 30 days after Contract Award 4. 14 days prior to PDR 5. 14 days prior to CDR 6. Spacecraft Pre-Ship Review | 7. Subsystem PDR 8. Subsystem CDR 9. HC 10. EC | 11. HC & EC 12. Standard Contractor Processes/ Procedures (Data Pkg. 14 days prior) 13. Once Per Launch Vehicle Design |
|---|--|--|
|---|--|--|

A/I - Approval/Information

U/AR - Update as Required

HC/EC - Hardcopy/Electronic copy

\* - Review Copies







### Table 1 Contract Data Requirement List

|           | Table 1 Contrac   |  | ata Requii       | CINCIL DISC                        |                 |      |       |              |                |  |        |
|-----------|---|--|------------------|------------------------------------|-----------------|------|-------|--------------|----------------|--|--------|
|           |   | SUBMISSION                                       |                  |                                    |                 |      |       |              | RD CC<br>T. CO | TOTAL<br>HARD                                    |        |
| DATA ITEM | TITLE   | A/I  | FREQ             | INITIAL                            | SUBSEQ          | UENT | MEDIA | Α            | В              | С  | COPIES |
| LV-3.8-21 | Launch Vehicle Countdown Procedures and Deviations              | A  | Per Mission      | In Accord. with<br>EWR 127-1       | U/A             | R    | 11    | 4            | 1              |  | 10     |
| LV-3.8-22 | Launch Vehicle Launch Commit Criteria                           | A  | Per Mission      | Wet Dress Rehersal<br>-2 Days      | L-7 D           | ays  | 11    | 4            | 1              |  | 10     |
| LV-3.8-23 | Senior NASA Management Mission Readiness<br>Review Data Package | I  | Per Mission      | L -1 Month                         |                 |      | 11    | 4            | 1              | 40   | 45     |
| LV-3.8-24 | Pre-Payload Mate Review   | I  | Once Per Mission | . 12                               |                 |      | 11    | 4            | ı              | 20   | 25     |
| LV-3.8-25 | Launch Readiness Review (LRR) Data Package                      | I  | Per Mission      | L -1 Day                           |                 |      | 11    | 4            | 1              | 40   | 45     |
| LV-3.8-26 | Launch Vehicle Post Launch Data Report                          | I  | Per Mission      | Prelim.<br>L +10 Days              | Fina<br>L +60 I |      | 11    | 4            | 1              |  | 5      |
|           |   | <del>                                     </del> |                  |                                    |                 |      |       | <u> </u>     | _              |  |        |
| LV-3.8-29 | Launch Operations Training Documentation                        |  | U/AR             | 2 months after<br>launch of GOES N | GOES N          |      | 11    | 2            | 4              |  | 6      |
|           |   | <del>                                     </del> |                  |                                    | ì               |      |       |              | <del> </del>   | <del>                                     </del> |        |
|           |   | F  |                  |                                    |                 |      |       |              |                |  |        |
|           |   | 士  |                  |                                    |                 |      |       |              |                |  |        |
|           |   | +  | •                |                                    |                 |      |       | <del> </del> | _              | -  |        |

| A/I - Approval/Information   | U/AR - Update as Required                             | HC/EC - Hardcopy/Electronic copy | * - Review Copies  | l |
|--|---|----------------------------------|--|---|
| 2. 75 days after Contract Start Date 3. 30 days after Contract Award | 5. 14 days prior to CDR 6. Spacecraft Pre-Ship Review | 8. Subsystem CDR 9. HC 10. EC    | 12. Standard Contractor Processes/ Procedures (Data Pkg. 14 days prior) 13. Once Per Launch Vehicle Design |   |
| Notes: 1. Contract Award   | 4. 14 days prior to PDR                               | 7. Subsystem PDR                 | 1 11. HC & EC  | ı |

Mod



| DATA ITEM DESCRIPTION |                        | 2. NUMBER | PM-1.1-01 |
|-----------------------|------------------------|-----------|-----------|
| 1. TITLE              | Program Status Reviews | 3. DATE   | 8/26/97   |

Provide management with a means for directing and monitoring the Project to ensure that the Project effort is being properly controlled. To present accomplishments compared to planned activities and recommendations on issues or concerns.

#### 5. DATA REQUIREMENTS

#### Bi-Monthly Program Status Review

The Program Status Review shall be rotated between the spacecraft contractor's facility (HSC), GFE instrument contractor plants, and GSFC and shall include all aspects of the effort covered by the contract. The Program Status Review documentation that shall be distributed to the attendees at the review shall consist of the agenda, presentation material, including detailed back-up material as needed, and documentation of action items and responses to action items, including supporting data as needed.



The Program Status Review presentation shall include, but not be limited to the following subjects:

- a. Accomplishments since last review and open action items
- b. Schedule
- c. Technical issues and concerns
- d. System and Subsystem status and activity
- e. Current problems and anticipated resolution
- f. Open contract items
- g. Planned effort for next review period
- h. Performance Assurance status
- i. Outstanding Proposals
- j. Milestone events depicting critical items of project status for the succeeding month with a report on the previous months milestone events
- k. Weight and power summary status
- 1. Subcontract Technical Performance
- m. Business issues, including personnel changes
- n. Launch vehicle/services and related activities status

#### Quarterly Program Status Review

The contractor shall present a Quarterly Management Review to the GSFC Director, and appropriate NASA and NOAA program management personnel. These reviews shall be conducted alternately at GSFC and the Contractor's facility. The typical agenda items for these reviews are indicated below.



a. Technical Performance and Implementation Status and Problem areas



| DATA ITEM DESCRIPTION |                               | 2. NUMBER | PM-1.1-01 |
|-----------------------|-------------------------------|-----------|-----------|
| 1. TITLE              | Program Status Reviews (Cont) | 3. DATE   | 8/26/97   |

### 5. DATA REQUIREMENTS - Cont.

- b. Major Milestone Event Status and Problem Areas
- c. Performance Assurance Status and Issues
- d. Contractual Issues
- e. Subcontractor Issues
- f. Action Item Status
- g. Launch Vehicle/Services and Related Activities





| DAT      | A ITEM DESCRIPTION | 2. NUMBER | PM-1.1-02 |
|----------|--------------------|-----------|-----------|
| 1. TITLE | Schedule Reports   | 3. DATE   | 8/26/97   |

Schedule reports are used to plan, monitor, communicate status, and control all activities, including pertinent resources and facilities, necessary to accomplish assigned tasks in compliance with the GOES N-Q spacecraft statement of work (SOW).

#### 5. DATA REQUIREMENTS

Preparation Information:

The contractor's in-house schedule system shall provide the basis for reporting schedule status to the NASA GOES Project Office. The following schedule reports (in tabular form and electronic media) shall be provided monthly.

- Master Logic Network and Master Schedule: A time phased schedule portraying all significant events, activities, and milestones of the program. It reflects the overall time allocated to meet specific requirements and establishes the ground rules for implementing the total program. The master schedule shall summarize the schedule data and status information contained in the intermediate level logic network schedules and shall include baseline as well as actual/forecast start and finish dates for all subassemblies, significant activities, events and milestones. A master schedule bar chart, clearly depicting the critical path(s) and suitable for view graph presentation to management, shall also be provided.
- 2) Intermediate Logic Network and Schedules: The logic network schedules are an expansion of the master schedule and shall reflect all appropriate CWBS elements. Intermediate Level Logic Network Schedules shall provide:
  - a. Sufficient detail to permit identification of the elements necessary for overall accomplishment.
  - b. Time phase the work elements of the CWBS.
  - c. Identify major interfaces between project organizations, functional departments, and associate contractors.
  - d. Establish controlled intermediate milestones to adequately monitor progress.
  - e. For each task/activity, the baseline start and completion dates; the current expected/planned start and completion dates, the number of work days required to accomplish the task, and the amount of float/slack in work days for each task, a unique activity identification number for each task, and a task description.

| DATA ITEM DESCRIPTION |          | 2. NUMBER               | PM-1.1-02 |         |
|-----------------------|----------|-------------------------|-----------|---------|
|                       | 1. TITLE | Schedule Reports (Cont) | 3. DATE   | 8/26/97 |

#### 5. DATA REQUIREMENTS - Cont.

- f. The critical path shall be derived from the intermediate level logic network schedules.
- 3) Detail schedules: These logic network and/or bar chart schedules are an expansion of the intermediate level logic network schedules and shall reflect all cost account plan activity (discrete effort only) schedules.
- NASA directed change implementation schedules: Stand alone bar chart schedules clearly identifying all tasks associated with implementing a specific NASA directed change (design through incorporation of the directed change into hardware, software, firmware, and associated documentation). The change schedule shall be provided by the contractor once, and then the changes shall be incorporated into the detail, intermediate and master schedules.
- Monthly schedule analysis narrative: The contractor shall submit a monthly narrative report describing the overall schedule position of the GOES N-Q spacecraft based on schedule float/slack analysis for each major subsystem/subassembly/assembly and compare current month completion date/float for that element with that of the prior month. The primary critical path shall be explained along with possible work-around and/or schedule risk mitigation plans being considered to maintain the schedule.
- The contractor shall maintain a log book identifying all schedule changes (task additions, deletions, duration adjustments, changes to logic, etc.) to the schedule baseline documentation and shall provide this data to the NASA GOES Project Office upon request.



| DA       | ATA ITEM DESCRIPTION | 2. NUMBER | PM-1.1-03 |
|----------|----------------------|-----------|-----------|
| 1. TITLE | GOES N Data Book     | 3. DATE   | 8/26/97   |

This document is to provide an introduction to the GOES-N Spacecraft and mission. It shall include a comprehensive overview of the satellite operational systems. It is intended to be used as a quick reference guide.

#### 5. DATA REQUIREMENTS

This Data Book shall serve as a convenient desk top technical reference for people who work on the GOES Program and those needing a satellite system overview. It should contain all general characteristics of the missions, including at least the following types of information. The Data Book shall be updated prior to the launch of each satellite.

- 1. Overview of the GOES Mission
- 2. Spacecraft Configuration & Design Concepts
- 3. Subsystem and Payload Instrument Descriptions
  - a. Structure Subsystem
  - b. Power Subsystem
  - c. Telemetry & Command Subsystem
  - d. Communications Subsystem
  - e. WEFAX and EMWIN data product/services
  - f. Search & Rescue System
  - g. Data Collection System
  - h. Attitude & Orbit Control Subsystem
  - i. Propulsion Subsystem
  - i. Image Navigation & Registration System
  - k. Imager Subsystem
  - 1. Sounder Subsystem
  - m. Solar X-Ray Imager Subsystem
  - n. Thermal Control Subsystem
  - o. Operations Ground Support Equipment consisting of NTACTS, GTACS and OATS
  - p. SEM Instruments Subsystem
  - q. Deployment Mechanisms
  - r. Launch Vehicle and Launch Network Description
- 4. Ground terminal facilities, such as the CDA Station, Space Environment Center, etc.
- 5. Data Product Descriptions
- 6. Launch trajectory, orbit requirements, and ground station location(s)
- 7. Subsystem Technical Performance Summary Tables







| DATA ITEM DESCRIPTION |                         | 2. NUMBER | PM-1.1-03 |
|-----------------------|-------------------------|-----------|-----------|
| 1. TITLE              | GOES N Data Book (Cont) | 3. DATE   | 8/26/97   |

### 5. DATA REQUIREMENTS - Cont.

This document is intended to be used as a reference guide and shall include top level block diagrams, simplified schematics, pictorials and narrative explanations suitable for public distribution.

#### 6. SPECIAL PREPARATION INSTRUCTIONS

The format and content of the GOES I-M Data Book can be used as a guide for preparation of the GOES-N Data Book.





| DA       | ATA ITEM DESCRIPTION                            | 2. NUMBER | PM-1.3-01 |
|----------|---|-----------|-----------|
| 1. TITLE | Configuration Control Board (CCB) Documentation | 3. DATE   | 8/26/97   |

To permit visibility of all changes in configured items (CIs) and controlling documentation proposed by the contractor.

#### 5. DATA REQUIREMENTS

The contractor shall prepare and submit the CCB agenda and data packages. The CCB agenda shall include the date, time, location, subject, sponsor, and change control number of the items to be reviewed by the board. Data packages shall be attached for each change with the precise format and content that will be reviewed be the contractor's board. The data packages will contain all relevant background material (including written agreements and memos between the Government and the contractor) and complete technical supporting analyses.

For the purpose of this DID, the term CCB shall mean the contractor's program-level CCB and any sub-board which is empowered to authorize the final disposition of an engineering change.



The contractor shall prepare and submit CCB minutes. These minutes shall include the date, time, location, item subject, change control number, and CCB disposition of the changes reviewed. A list of actions generated from the CCB for each change and the date it is to be completed must be included in the minutes. For approved changes, the change classification and effectivity shall also be specified. When changes are disapproved, a reason(s) shall be included.



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| DATA ITEM DESCRIPTION |                              | 2. NUMBER | PM-1.3-02 |
|-----------------------|------------------------------|-----------|-----------|
| 1. TITLE              | ECPs, Deviations and Waivers | 3. DATE   | 8/26/97   |

To facilitate the configuration control of system design changes.

#### 5. DATA REQUIREMENTS

The contractor shall prepare and submit all Class I Engineering Change Proposals (ECPs) in accordance with MIL-STD-973. When an interface control document change proposal is generated by a GFE instrument contractor, the S/C contractor shall review the change, recommend the action to be taken (i.e., approval/disapproval) and submit it to NASA as a Class I ECP. ECP forms DG1692 and DD1692-1 shall apply. In addition to the change description, the ECP shall contain sufficient information in the form of attachments, drawings, test results, etc., to allow NASA to evaluate the total impact of the proposed change. NASA may direct the contractor to prepare ECPs under the "changes" clause of the contract. The contractor shall also submit all Class II changes for NASA review.



The contractor shall use the block of numbers between 6000 and 6999 to identify the Engineering Change Proposals (ECP's) that are prepared for submittal to GSFC.

For the purposes of this DID, a Class I ECP is a change that:

- a. Affects any NASA Contract specification or interface requirement.
- b. Affects schedules of end item deliverables to the GOES Project.
- c. Impacts Government Furnished Equipment.
- d. Affects configuration to the extent that changes would be required to prior deliverables in order to maintain specified performance.

Waivers and deviations shall be handled in accordance with MIL-STD-973.





| DATA     | A ITEM DESCRIPTION                      | 2. NUMBER | PM-1.3-03 |
|----------|---|-----------|-----------|
| 1. TITLE | Engineering Drawings and Change Notices | 3. DATE   | 8/26/97   |

To provide layouts and engineering drawings to serve as the basis for technical discussions, evaluations, operations, and maintenance.

#### 5. DATA REQUIREMENTS

The contractor shall submit engineering drawings used to procure, manufacture, assemble, integrate, and test the satellite down to the Configuration Item (CI) level. Lower level drawings will be provided upon request. Drawings that are used to maintain and control S/C interfaces shall also be provided. Included in this engineering drawing package shall be all reference type drawings such as layouts, schematics, diagrams, etc. Sketch type drawings shall not be used. Interface control drawings and applicable spacecraft layouts shall include the stowed, extended, and critical intermediate positions of the moving mechanical assemblies and deployables with respect to fields of view and surrounding structure, components or other hardware. All drawing changes and change notices are included under this requirement.



An indentured drawing list (including drawings from subcontractors) shall be provided to NASA. An explanation of company procedures for locating drawings in this package shall be provided with this list.

All engineering drawings shall be prepared in accordance with the contractor's core level drawing requirements manual and shall be made available to NASA personnel via the contractor's electronic data distribution system. Drawings not available in electronic format may be submitted in hardcopy or DAC format.





| DA       | TA ITEM DESCRIPTION                             | 2. NUMBER | PM-1.3-04 |
|----------|---|-----------|-----------|
| 1. TITLE | Hardware/Software Configuration Management Plan | 3. DATE   | 8/26/97   |

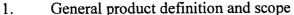
Defines the contractor's configuration management system (including policies and procedures) that will be implemented for the GOES N-Q spacecraft project.

#### 5. DATA REQUIREMENTS

#### Preparation information:

The contractor's hardware/software configuration management plan shall be prepared in accordance with the requirements of MIL-STD-973 (Military Standard Configuration Management). This plan shall describe in detail all configuration management processes, methods, and procedures the contractor intends to use on the GOES N-Q spacecraft project. This plan shall describe how hardware and software configuration management is accomplished and how consistency between product definition, the product's configuration, and the configuration management records is achieved and maintained throughout the applicable phases of the product's life cycle by the contractor.

The configuration management plan shall describe the contractor's approach, methodology and application of configuration management principles and practices and shall include the following:



- 2. Description of configuration management activities and procedures for each of the following configuration management functions:
  - a. Configuration planning and management
  - b. Configuration Identification
  - c. Configuration Change Management
  - d. Configuration Status Accounting
  - e. Configuration Verification and Audit
  - f. Configuration Management of digital data
- 3. Organization, roles, responsibilities and resources
- 4. Definition of terms
- 5. Programmatic and organizational interfaces
- 6. Deliverables, milestones, and schedules
- 7. Subcontract flow down





| DAT      | A ITEM DESCRIPTION                     | 2. NUMBER | PM-1.3-05 |
|----------|--|-----------|-----------|
| 1. TITLE | Configuration Item Identification List | 3. DATE   | 8/26/97   |

To establish a structure for controlling the configuration of the spacecraft and ground segment by identifying all Configuration Items (CIs) and Computer Software Configuration Items (CSCIs) used on the program and correlating those CIs/CSCIs to their Specification and test requirements documents.

#### 5. DATA REQUIREMENTS

The contractor shall prepare and submit a Configuration Item Identification List (CIIL) which identifies all CIs and CSCIs. This Configuration Item Identification List shall conform to the following:

- a. The Configuration Item Identification List shall be organized and broken down as follows:
  - 1) All system level CIs and CSCIs.
  - 2) All subsystem level CIs and all CIs/CSCIs within each subsystem.
- b. For each CI listed, the following information shall be provided:
  - 1) Assigned CI Number.
  - 2) The CI top drawing number.
  - 3) The CI nomenclature.
  - The applicable specification number. For those CIs not governed by a specification, the word "NONE" shall be entered in this column.
  - Acceptance test procedure number and, if qualification tested, the qualification test procedure number. If the CI is neither acceptance nor qualification tested, the functional test procedure number should be entered in this column.
- c. For each CSCI listed the following information shall be provided:
  - 1) Assigned CSCI Number
  - 2) The CSCI nomenclature.
  - The applicable specification number. For those CSCIs not governed by a specification, the word "NONE" shall be entered in this column.
  - 4) Acceptance test procedure number and, if qualification tested, the qualification test procedure number. If the CSCI is neither acceptance nor qualification tested, the functional test procedure number should be entered in this column.
- d. This list shall be prepared in the contractor's format.





| DAT      | TA ITEM DESCRIPTION                          | 2. NUMBER | PM-1.3-06 |
|----------|--|-----------|-----------|
| 1. TITLE | External Independent Readiness Review (EIRR) | 3. DATE   | 8/26/97   |

The External Independent Readiness Review (EIRR) will be held at the spacecraft and launch vehicle contractor's facility prior to the launch of each satellite. The purpose of the review is to have an independent panel of experts review the launch readiness of each satellite and launch vehicle.

#### 5. DATA REQUIREMENTS

The contractor shall prepare and provide an in-depth review of each satellite and launch vehicle prior to launch. The review team shall also perform a readiness review of the launch support network, launch and post launch activities and the planned test plans and procedures.

The review requirements are described in the S-415-27 document, titled "Program Review Requirements for the GOES-N Program".





| DATA ITEM DESCRIPTION |                                    | 2. NUMBER | SE-2.1-01 |
|-----------------------|------------------------------------|-----------|-----------|
| 1. TITLE              | System Concept Review Data Package | 3. DATE   | 8/26/97   |

The SCR is held to assure that the objectives and requirements of the spacecraft being designed are understood and that the proposed approach will meet these requirements. The emphasis should be on the requirements, how they flow down, the proposed design concept and the definition of the major system interfaces. Detailed interfaces are a part of a later review.

The output of the SCR is a baseline design subject to the closure of any action items resulting from the review.

#### 5. DATA REQUIREMENTS

The SCR data package shall contain the following minimum material.

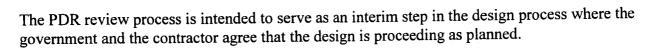
- a. Mission/Spacecraft Design Objective
- b. Payload Instrument Requirements
- c. Constraints
- d. Technical/Performance Requirements
- e. Organizational Interfaces
- f. Technical Interfaces
- g. System Drivers
- h. Safety Considerations
- i. Risk Areas
- j. Proposed Design Approach
  - i. System Design
  - ii. Mechanical
  - iii. Electrical
  - iv. Thermal
  - v. Software
- k. Ground Support Equipment
- 1. Operations
- m. Planned Test Program
- n. Specification and Drawing Trees
- o. Mass Properties Reports
- p. Power Profile Report
- q. Single Point Failure Modes
- r. System grounding plan for spacecraft and GFE instrument power and signal lines
- s. Approach for achieving/maintaining compatibility with Atlas and Delta launch vehicles families





| DAT      | TA ITEM DESCRIPTION                          | 2. NUMBER | SE-2.1-02 |
|----------|--|-----------|-----------|
| 1. TITLE | Preliminary Design Review (PDR) Data Package | 3. DATE   | 8/26/97   |

The PDR is the first major review of the detailed design and is normally held prior to the preparation of formal design drawings. The PDR is held when the design is advanced sufficiently to begin some bread board testing and/or the fabrication of design models. Detail designs are not expected at this time, but system engineering, resource allocations and design analyses are required to demonstrate compliance with requirements. A presentation of the design and interfaces by means of block diagrams, signal flow diagrams, schematics, logic diagrams, error budgets, link margins, first interface circuits, packaging plans, configuration and layout sketches, analyses, modeling and any early results are required. Supporting data and analyses for mechanical, power, thermal, and electronic design: load, stress, margins, reliability assessments, should be shown. Software requirements, design, structure, logic flow diagrams, Central Processing Unit (CPU) loading, design language and development systems need to be specified. Parts selection, de-rating criteria, and radiation hardness, are an important part of the PDR. The identification of single point failure modes need to be assessed as well as critical design areas which may be life limiting. Robustness of the selected design needs to be shown.



### 5. DATA REQUIREMENTS

The Preliminary Design Review Package should address the following minimum items:

- a. Payload Instruments and Payload Communications Systems/Technical Objectives, Requirements General Specification
- b. Closure of Actions from Previous Review/Changes since the last review
- c. Performance Requirements
- d. System-Level Error Budgets, including error allocations to subsystem and components
- e. Data rates, Telemetry List, Command List, EMI/EMC
- f. Interface Requirements
- g. Mechanical/Structural Design, Analyses, and Life Tests
- h. Electrical, Thermal, Optical/Radiometric Design and Analyses
- i. Software Requirements and Design
- j. Ground Support Equipment Design
- k. System Performance Budgets
- 1. Design Verification, Test Flow and Calibration/Test Plans
- m. Mission and Ground System Operations
- n. Launch Vehicle Interfaces and Drivers
- o. Parts Selection, Qualification, and Failure Mode and Effects Analysis (FMEA)
  Plans





| DA       | ATA ITEM DESCRIPTION                                | 2.<br>NUMBER | SE-2.1-02 |
|----------|---|--------------|-----------|
| 1. TITLE | Preliminary Design Review (PDR) Data Package (Cont) | 3. DATE      | 8/26/97   |

#### 5. DATA REQUIREMENTS - Cont.

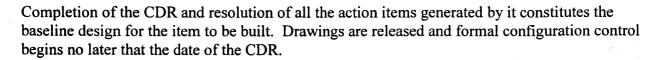
- p. Contamination Requirements and Control Plan
- q. Safety, Quality Control, Reliability and Redundancy
- r. Materials and Processes
- s. Acronyms and Abbreviations
- t. Specification and Drawing Trees
- u. Mass Properties Report
- v. Power Profile Report
- w. Single Point Failure Modes
- x. Requirements Traceability Matrix
- y. GFE Instrument Interface Design, including analyses supporting design choices
- z. System grounding plan for spacecraft and GFE instrument power and signal lines
- aa. Compatibility with Atlas and Delta launch vehicle families





| DATA ITEM DESCRIPTION |   | 2. NUMBER | SE-2.1-03 |
|-----------------------|---|-----------|-----------|
| 1. TITLE              | Critical Design Review (CDR) Data Package | 3. DATE   | 8/26/97   |

The CDR is held near the completion of the engineering model (if applicable) and bread board development stage. This should be prior to any design freeze and before any significant fabrication activity begins. The CDR presents a final detailed design using substantially completed drawings, analyses and bread board/engineering model evaluation testing to show that the design will meet the final performance and interface specifications and the required design objectives. The CDR should represent a complete and comprehensive presentation of the entire design. It should present the final design and interfaces by means of block diagrams, power flow diagrams, signal flow diagrams, interface circuits, layout drawings, software logic flow and timing diagrams, design language, modeling results, bread board and engineering model test results and changes required to the design presented at the PDR. Final estimates of weight, power, and volume are to be presented. Final calculations for mechanical loads, stress, torque margins, thermal performance, radiation design and expected lifetime are to be presented. Final software requirements and updated system performance estimates should also be presented. Parts selection, de-rating criteria and screening results, calculated reliability and the results of a Failure Modes and Effects Analysis (FMEA) are to be presented. The CDR should include all of the items specified for a PDR, updated to the final present stage of development process, plus the additional data requirements described below in title block 5.



#### 5. DATA REQUIREMENTS

The Critical Design Review Package should address the following minimum items.

- a. Evolution and Heritage of the Final Design
- b. Combined Optical, Thermal, and Mechanical Budgets or Total System Performance
- c. Closure of Actions from the Previous Review
- d. Interface Control Documents
- e. Final Implementation Plans including: Engineering Models, Prototypes, Flight Units, and Spares
- f. Engineering Model/Breadboard Test Results and Design Margins
- g. Completed Design Analyses
- h. Qualification Test Plans
- i. Launch Vehicle Interfaces
- i. Ground Operations
- k. System Safety
- 1. Reliability Analyses results: FMEA, Worst Case Analysis, Fracture Contro

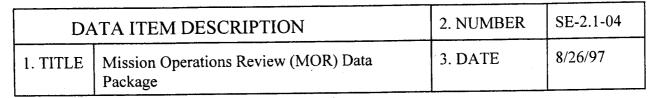




| D.A      | ATA ITEM DESCRIPTION                             | 2. NUMBER | SE-2.1-03 |
|----------|--|-----------|-----------|
| 1. TITLE | Critical Design Review (CDR) Data Package (Cont) | 3. DATE   | 8/26/97   |

#### 5. DATA REQUIREMENTS - Cont.

- m. Problem Areas
- n. Schedules
- o. Open Items
- p. Specification and Drawing Trees
- q. Mass Properties Report
- r. Power Profile Report
- s. Single Point Failure Modes
- t. Requirements Traceability Matrix
- u. GFE Instrument Interface Design, including analysis supporting design choices
- v. System-Level Error Budgets, including error allocations to subsystems and components
- w. System grounding plan for spacecraft and GFE instrument power and signal lines
- x. Compatibility with Atlas and Delta launch vehicle families



The spacecraft contractor shall support the government in preparing and presenting the MOR. The MOR is the first of the two reviews which concentrate on the ground system and flight operations preparations. All mission-oriented operations will be addressed including payload instrument and communications systems, spacecraft and ground systems operations. The overall design and status of the ground system is reviewed to assure that the requirements for spacecraft payload data and spacecraft operations support and for data processing and analysis support are understood and that the proposed approach will meet the requirements. The operational interfaces between the ground system and flight system will be reviewed with respect to proper system engineering of operational trade-offs, signal link margins, constraints, and modes of operation including safe modes. Mission integration of pre-launch test planning including all planned tests between the flight segment and the ground system will be reviewed. The relationship between planned ground system software releases/capabilities and planned tests with the flight segment will be included. The plans and status for flight operations team and science operations preparations will be presented.

The mission operations review should occur prior to significant integration and test of the flight system and ground system.

All data requirements shall be addressed in the GOES-N MOR. Only delta changes affecting these data requirements shall be addressed in the GOES O-Q MOR.

CCR 4226C MOD 49

#### 5. DATA REQUIREMENTS

The Mission Operations Review Data Package should address the following minimum items.

- a. Objectives
- b. Overall Schedule and Status including: Documentation (i.e. spacecraft operations concept, ground system requirements, flight operations and contingency plans and Interface Control Documents)
- c. Closure of action items from previous reviews (e.g., Project-unique ground system reviews)
- d. Mission, Payload Instruments and Communications Services, Spacecraft, Flight Software, and Ground System Overviews
- e. Flight Software Maintenance Approach
- f. Flight Operations Team build up and Training Plans
- g. Pre-launch Test Plans including: RF and Project Operations Control Center (POCC) Compatibility Tests, Data Flow and End-to-End Tests, Simulations and exercises, Launch Site and Pad Tests
- h. Launch and early orbit overview including deployment activities and coverage
- i. In-orbit Checkout Overview
- j. Project Database and Procedure Development
- k. Spacecraft and Instrument Operations Constraints



| DA       | TA ITEM DESCRIPTION                           | 2. NUMBER | SE-2.1-04 |
|----------|---|-----------|-----------|
| 1. TITLE | Mission Operations Review Data Package (Cont) | 3. DATE   | 8/26/97   |

#### 5. DATA REQUIREMENTS - Cont.

- 1. Spacecraft Subsystem Level Activities
- m. Mission Planning and Scheduling
- n. On-board Data Memory Management
- o. Real-time Operations including: Health and Safety Monitoring, Safe Mode Operation
- p. Trend Analysis Plans including Reports and Archiving
- q. Science Operations Planning, Data Processing and Analysis
- r. Ground System Requirements and Development Status
- s. Mission Readiness Testing
- t. Preliminary List of all Launch Critical Facilities and Functions
- u. Issues and Concerns
- v. Specification and Drawing Trees
- w. Mass Properties Report
- x. Power Profile Report





| DATA ITEM DESCRIPTION |   | 2. NUMBER | SE-2.1-05 |
|-----------------------|---|-----------|-----------|
| 1. TITLE              | Pre-Environmental Review (PER) Data Package | 3. DATE   | 8/26/97   |

The PER is required prior to the start of formal environmental testing. The purpose of the PER is to evaluate the planned test/calibration program and test flow to assure that it meets the program needs and to assure that a proper baseline of performance of the spacecraft to be tested has been established, and the spacecraft is ready to begin a qualification test program to demonstrate end-to-end or system performance. All performance liens, waivers, action items, malfunction reports and open items should be closed or dispositioned. Could-Not-Duplicate (CNDs) items should not be closed and their discussion or risk assessment should include what fault tree was done, possible causes, testing/on-orbit impacts, as well as "can we see it" in the follow-on test phases. The test verification matrix, including measurement tolerances, stimuli, contamination control, and results from the Comprehensive Performance Test (CPT) should be discussed along with the final results of any life tests. Failure free operating time on the item to be tested should be presented.

Following a successfully completed PER and the close-out of any remaining items, the hardware is ready to begin its environmental qualification or acceptance test program.



### 5. DATA REQUIREMENTS

The PER Data Package should address the following minimum items.

- a. Changes since the Critical Design Review
- b. Program Status and General Test Readiness
- c. Test Plans and Procedures
- d. Test Objectives/Conditions/Levels/Configuration
- e. Test Facilities and Certification
- f. Test Fixtures and Support Equipment
- g. Instrumentation
- h. Success/Abort Criteria
- i. Test Flow including: Calibration, Number of Thermal/Vacuum Cycles, where the CPTs will be performed and thermal analysis showing that thermal test objectives can be met, and length of time required for transitions.
- j. Compliance with or Status of Test Verification Matrix
- k. Schedule
- 1. Documentation Status
- m. Functional and Environmental Test History of the Hardware
- n. Product Assurance and Safety
- o. Previous Anomalies, Deviations, Waivers, and their resolution
- p. Identification of Residual Risk Items
- q. Open Items and plans for close-out



| . DA     | ATA ITEM DESCRIPTION                               | 2. NUMBER | SE-2.1-05 |
|----------|--|-----------|-----------|
| 1. TITLE | Pre-Environmental Review (PER) Data Package (Cont) | 3. DATE   | 8/26/97   |

#### DATA REQUIREMENTS - Cont. 5.

- Final Calibration r.
- Mass Properties Report Power Profile Report s.
- t.



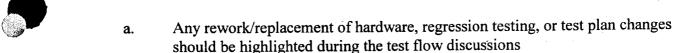
| DA       | TA ITEM DESCRIPTION                    | 2. NUMBER | SE-2.1-06 |
|----------|--|-----------|-----------|
| 1. TITLE | Pre-Shipment Review (PSR) Data Package | 3. DATE   | 8/26/97   |

The PSR occurs prior to the shipment of the spacecraft to its destination. The purpose of the PSR is to assure the design of the spacecraft has been validated through the environmental qualification and/or acceptance test program, that all deviations, waivers and open items have been satisfactorily dispositioned and that the spacecraft, along with all the required documentation, operation procedures, etc., is ready for shipment. The results of system testing, alignment, calibration and end item performance are to be demonstrated and documented. The solutions to all problems encountered during the environmental test and validation program and the solution rationale are to be presented.

Satisfactory completion of the pre-shipment and the close-out of any actions from the review indicate the item is ready for shipment.

#### 5. DATA REQUIREMENTS

The PSR Data Package should address the following minimum items.



- b. Compliance with the test verification matrixc. Measured Test Margins versus Design Estimates
- d. Demonstrate Qualification/Acceptance Temperature Margins
- e. Any data which has been trended to identify compliance with specification should be presented, especially if there has been a change or drift to the trend.
- f. Total failure-free operating time of the item
- g. Could-Not-Duplicate failures should be presented along with assessment of the problem and the residual risk that may be inherent in the item
- h. Project assessment of any residual risk
- i. Shipping Containers, Monitoring/Control Plans and Mode of Transportation
- j. Ground Support Equipment Status
- k. Post Shipment Plans
- 1. Launch Preparation Plan
- m. Identification of all approved satellite waivers
- n. Post Storage Data





| DAT      | TA ITEM DESCRIPTION                         | 2. NUMBER | SE-2.1-07 |
|----------|---|-----------|-----------|
| 1. TITLE | Flight Operations Review (FOR) Data Package | 3. DATE   | 8/26/97   |

The spacecraft contractor shall support the government in preparing and presenting the FOR. The FOR is held near the completion of pre-launch testing between the flight segment and the ground system. The plans for final end-to-end testing and simulations will be reviewed. The results of previous testing will be included (i.e discrepancy summary, network compatibility assessment, training status, etc.). The final launch, orbital operations, and checkout plans will be presented.

CCR 4226C MOD 4

#### 5. DATA REQUIREMENTS

The FOR Data Package should include all of the items specified for an MOR, updated to the present stage of progress, plus the following additional items:

- a. Closure of actions from the MOR
- b. New requirements and changes in plans
- c. Test result summaries including contractor's assessment of the criticality of open problems
- d. Work remaining including tests, simulations, and closure of problems
- e. Personnel location for launch and early orbit and in-orbit checkout including Project Office, Operations, and Spacecraft Subsystem expert personnel
- f. Contingency procedures, development and verification/validation status



| DATA ITEM DESCRIPTION |   | 2. NUMBER | SE-2.1-08 |
|-----------------------|---|-----------|-----------|
| 1. TITLE              | Spacecraft Launch Readiness Review (LRR) Data Package | 3. DATE   | 8/26/97   |

The Spacecraft LRR assesses the overall readiness of the mission and is normally held three days prior to a scheduled launch. It is a review of the total system to support the flight objectives of the mission. It is a review of the flight hardware and software, the launch vehicle, all the ground support systems, and the launch and orbital operations for their readiness to support the launch. The review is to cover all the activity since the Pre-Shipment Review and the Flight Operations Readiness Review, the closure of any actions from those reviews and a summation of all testing and launch operations planning and rehearsals to the present. Any open items and residual risks are to be presented at this time. Closure of this review and any actions generated from the review indicate the mission is ready for launch.

#### 5. DATA REQUIREMENTS

The Spacecraft LRR Data Package shall include the following minimum material:

a. Summary of launch base test activities and satellite processing

b. Final mass properties including spacecraft launch weight, i.e. dry s/c weight and propellant weight

#### 6. SPECIAL PREPARATION INSTRUCTIONS

The spacecraft LRR is conducted prior to the integrated Spacecraft/Launch Vehicle LRR, NASA GSFC is the chair of the spacecraft LRR.





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| DAT      | A ITEM DESCRIPTION                     | 2. NUMBER | SE-2.1-09 |
|----------|--|-----------|-----------|
| 1. TITLE | Pre-Storage Review (PSTR) Data Package | 3. DATE   | 09/10/98  |

The PSTR occurs prior to the storage of the spacecraft, if required. The purpose of the PSTR is to assure the design of the spacecraft has been validated through the environmental qualification and/or acceptance test program, that all deviations, waivers and open items have been satisfactorily dispositioned and that the spacecraft, along with all the required documentation, operation procedures, etc., is ready for storage. The results of system testing, alignment, calibration and end item performance are to be demonstrated and documented. The solutions to all problems encountered during the environmental test and validation program and the solution rationale are to be presented.

Satisfactory completion of the pre-storage and the generation of a mutually agreeable action item closure plan.

### 5. DATA REQUIREMENTS

The PSTR Data Package should address the following minimum items.

- a. Any rework/replacement of hardware, regression testing, or test plan changes should be highlighted during the test flow discussions
- b. Compliance with the test verification matrix
- c. Measured Test Margins versus Design Estimates
- d. Demonstrate Qualification/Acceptance Temperature Margins
- e. Any data which has been trended to identify compliance with specification should be presented, especially if there has been a change or drift to the trend.
- f. Total failure-free operating time of the item
- g. Could-Not-Duplicate failures should be presented along with assessment of the problem and the residual risk that may be inherent in the item
- h. Project assessment of any residual risk
- i. Storage Containers, Monitoring/Control Plans
- j. Identification of all approved satellite waivers



| DA       | TA ITEM DESCRIPTION                    | 2. NUMBER | SE-2.2-01 |
|----------|--|-----------|-----------|
| 1. TITLE | GFE Instrument Interface Documentation | 3. DATE   | 8/26/97   |

This document will be used to define the Spacecraft contractor's electrical, mechanical and thermal interface to the GFE instruments.

#### 5. DATA REQUIREMENTS

The contractor shall prepare the GFE Instrument Interface Documentation for each GFE instrument that contains the following minimum material.

- a. Provide a document that describes the circuits that are used by the spacecraft contractor and the GFE instrument contractor for all electrical signals between the spacecraft and GFE instruments.
- b. The interface document shall also describe all the power grounds and signal return compatibility between the S/C and the GFE instruments.
- c. Define the mechanical, thermal, and INR interface with each GFE Instrument.
- d. Define the ESD protection and radiation shielding provisions for the GFE instruments.
- e. Define the contamination environment the spacecraft generates in the vicinity of the instrument thermal and optical surfaces.
- f. Any other ICD relevant information.
- g. Definition of the spacecraft GSE to instrument GSE interface for all GSE components.

#### 6. SPECIAL PREPARATION INSTRUCTIONS

Information will be incorporated into the GFE instrument ICD's.





| DAT      | A ITEM DESCRIPTION                        | 2. NUMBER | SE-2.3-01 |
|----------|---|-----------|-----------|
| 1. TITLE | System Requirements Traceability Database | 3. DATE   | 8/26/97   |

The GOES System Requirements Traceability Database shall maintain all functional, allocated, suballocated, derived, and detailed design requirements. The database shall be used for generating a requirements traceability report.

### 5. DATA REQUIREMENTS

In order that clear accountability of the GOES requirements traceability is accomplished, the contractor shall establish a requirements traceability database. This database shall be used throughout the program analysis, definition, design, implementation, testing, integration and verification phases. The "database" shall capture all system and subsystem level requirements starting with the allocation of each of the requirements given in S-415-22 Performance Specification and the GFE instrument ICD's. Component level requirements shall be traced when required to satisfy a NASA approval document.



The database shall be maintained and kept current on a working level basis. It shall provide the source for the design requirements at the system, subsystems, and segments, including any subcontracting organizations.

The database shall be available for electronic delivery upon the request of GSFC.



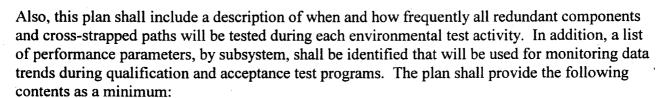


| DAT      | TA ITEM DESCRIPTION           | 2. NUMBER | SE-2.4-01 |
|----------|-------------------------------|-----------|-----------|
| 1. TITLE | Performance Verification Plan | 3. DATE   | 8/26/97   |

Provide a description of the system performance and verification test program, and describe the specific tests and/or analysis that will collectively demonstrate that the hardware/software complies with the performance requirement described in S-415-22, and the GFE instrument ICD's.

#### 5. DATA REQUIREMENTS

This plan shall identify the test plans and analyses to be performed at each level of assembly in the system, subsystem through fully integrated s/c and SSGS, to demonstrate that the system (hardware and software) meets its performance and environmental requirements. The plan shall identify, where applicable, the combination of tests and analyses to be used to verify each performance and/or environmental requirement and whether verification is conducted on test modules or flight hardware/ software. Included should be descriptions of functional measurements planned at the component, subsystem, integration and system level as well as descriptions of methods planned to make the measurements.



- a. Performance Verification Matrices (PVM) which map performance and design requirements/parameters against the verification methods, to include the level of verification, test procedure reference and, when applicable analysis documents to prove compliance with the system specifications. The Performance Verification Plan (PVM) shall be deliverable in both electronic database and in hardcopy format as a separate volume of the PVP.
  - 1. A "requirement sort" of the matrices will report all of the verifications attributable to a specific requirement, which can be evaluated for the comprehensiveness of the verification set.
  - 2. A "verification sort" will report all of the requirements attributable to the verification that will indicate to the verification planner the exact objectives of any specific verification (the requirements to be verified).
  - 3. Both of these sorts of the matrices will be available within the electronically delivered version of the CDRL. For example, a specific sort of "verification type = test and level = system" will list all system level tests. Specific sorts shall be available on request.



CCR 4226C MOD 49





| DA       | TA ITEM DESCRIPTION                  | 2. NUMBER | SE-2.4-01 |
|----------|--------------------------------------|-----------|-----------|
| 1. TITLE | Performance Verification Plan (cont) | 3. DATE   | 8/26/97   |

b. Detailed test flow sequence charts showing sequence of development and subsystem testing, including integration and qualification/acceptance activities for components, subsystem, spacecraft, GFE instruments, the SEM instruments, and the INR system (i.e., spacecraft and SSGS).

CCR 4226C MOD 49

- c. Component Life Test Plans that describe the test article configuration and how specification life requirements will be verified. These Plans apply to all component hardware to be life tested and should describe details such as instrumentation monitoring, facility control sequences, test article functions, test parameters, quality control checkpoints, pass/fail criteria, data collection, reporting requirements, and safety and contamination control provisions.
- d. Plan for the verification of all previously flown and qualified hardware, including identification of additional verifications required.
- e. An environmental test plan that documents the spacecraft contractor's approach for qualification and acceptance tests. It is intended to provide general test philosophy and an overview of the system-level environmental testing to be performed to demonstrate adequacy of the spacecraft for flight (e.g. static loads, vibration, acoustics, shock, etc.) It should include test objectives, unit under test, configuration and general test methods.
- f. End-to-End System and Compatibility Test Plans that describe the tests to be performed to verify that the entire spacecraft system (end-to-end) meets performance requirements that are described in paragraph 3.6.2 of the S-415-23 Statement Of Work. This document shall provide details on how the fully integrated system will be tested in an executable system configuration (End-to-End), the sequence and schedule of the test flow, and it shall include a verification matrix. The plan also describes the test facilities and support resources needed for this test.
- g. Plan for certification for spacecraft and GFE instrument handling equipment.
- h. A list of performance parameters by subsystem shall be identified that will be used for monitoring data trends during the spacecraft qualification and acceptance test programs.
- i. Provide the test plan, test sequence, and a description of the tests and activities that will be performed at the launch site.
- j. Provide the descriptions for tests that are identified in the performance verification matrix.





| DATA     | ITEM DESCRIPTION                     | 2. NUMBER | SE-2.4-01 |
|----------|--------------------------------------|-----------|-----------|
| 1. TITLE | Performance Verification Plan (Cont) | 3. DATE   | 8/26/97   |

For the INR system, provide a description of the pre-launch test philosophy/approach that will be used to confirm performance and interface compatibility with the ACS, Imager and Sounder Instruments, and the SSGS. Include a discussion of the INR Performance Evaluation System and the planned application for testing. Also include use of the Wide Field of View Collimator (WFC).

- k. Describe the proposed ESD qualification test plan that will be used at the component and spacecraft levels of assembly.
- l. Provide the post-launch test plan that will be followed prior to spacecraft engineering hand-over (24 days) to the government
- m. Provide the recommended test plan that the government will perform during the PLT phase.
  - 1. Describe the recommended test plan for each s/c subsystem that will characterize its baseline in-orbit performance.
  - 2. Describe the recommended plan for testing the primary, redundant and/or cross-strap signal paths and equipment.
  - 3. Provide a recommended post-launch INR test approach describing the tests to be performed by NASA to initialize and/or characterize INR on-orbit performance and the interval required between calibrations. Test groups may be used in lieu of test plans for each required INR calibration and/or initialization procedure to provide a clear overview of the overall procedure. Each test plan/group presented above shall contain the number of times the test is expected to be performed to characterize each calibration and/or the interval required between calibrations, and recommendations for when the test should or be done (e.g., seasonally, time of day).
- n. Spacecraft-level thermal balance and thermal test profiles.







| DATA     | A ITEM DESCRIPTION                     | 2. NUMBER | SE-2.4-02 |
|----------|--|-----------|-----------|
| 1. TITLE | Performance Verification Specification | 3. DATE   | 8/26/97   |

Provide technical requirements and approach for demonstrating that each flight and ground hardware and software item complies with its performance requirements.

#### 5. DATA REQUIREMENTS

This specification shall include, as a minimum:

- a. Environmental test specification requirements
  - 1. Standard conditions for all test areas (temp., humidity, cleanliness)
  - 2. Qualification and acceptance test temperatures (incl. uncertainties)
  - 3. Shock test requirements
  - 4. Radiation levels
  - 5. Acoustic excitation levels
  - 6. Qualification and acceptance vibration test levels
  - 7. Electromagnetic test levels
- b. Thermal and thermal vacuum test profiles for all components.
- c. Item moved to SE-2.4-01 (n).
- d. Deleted
- e. Performance parameter accept/reject criteria will be covered in the detailed test procedures for each component which is not part of this DID.
- f. Measurement tolerances for weight, center-of-gravity and moments-of-inertia.





| DATA     | ITEM DESCRIPTION                | 2. NUMBER | SE-2.4-03 |
|----------|---------------------------------|-----------|-----------|
| 1. TITLE | Spacecraft Design Specification | 3. DATE   | 8/26/97   |

The Spacecraft Design Specification shall delineate the contractor's design for the GOES Spacecraft. It shall establish the top level design and interface specification(s) placed on the Spacecraft in response to the NASA Specification, S-415-22, and the GFE instrument ICD's.

#### 5. DATA REQUIREMENTS

In order to assure that the contractor is performing in accordance with the Statement of Work and Specifications, the contractor shall provide a Spacecraft Design specification that will be used by the contractor to direct the development of the entire Spacecraft. The lower level System and Subsystem level specifications shall be directed and controlled by the Spacecraft Design specification. The specification shall divide and allocate the design responsibilities and interfaces between all of the elements of the spacecraft.



#### 6. SPECIAL PREPARATION INSTRUCTIONS

The contents of the Spacecraft Design Specification should be in accordance with MIL-STD-490, or the contractor's equivalent format.



| DATA     | ITEM DESCRIPTION            | 2. NUMBER | SE-2.4-10 |
|----------|-----------------------------|-----------|-----------|
| 1. TITLE | Systems Verification Review | 3. DATE   | 8/26/97   |

The contractor shall convene a System Verification Review (SVR) to present the performance verification plan (SE-2.4-01) to describe the specific tests and/or analysis that will collectively demonstrate that the hardware/software complies with the performance requirements described in S-415-22, the GFE instrument ICD's, the performance verification specification (SE-2.4-02), and the baseline system design specification (SE-2.4-03).

#### 5. DATA REQUIREMENTS.

The review package shall at a minimum shall include the following:

- a. Summary presentation of the Spacecraft Design Specification (SE-2.4-03) used by the contractor to direct the development of the entire Spacecraft. The lower level System and Subsystem level specifications that are directed and controlled by the Spacecraft Design specification shall be delineated. The specification(s) shall divide and allocate the design responsibilities and interfaces between all of the elements of the spacecraft.
- b. Summary presentation of the Performance Verification Specification (SE-2.4-02) used to define the environment test specification requirements and the thermal and thermal vacuum test profiles for all flight and ground hardware items.
- c. Summary presentation of the Performance Verification Matrices (SE-2.4-01, item a.) used by the contractor to allocate requirements to sub-requirements and to verifications.
- d. A presentation of the Performance Verification Plan (SE-2.4-01) used by the contractor to identify the test plans and analyses to be performed at each level of assembly in the system, component through fully integrated spacecraft, to demonstrate that the system (flight/ground hardware and software) meets its performance and environmental requirements. The plan shall identify the combination of tests and analyses to be used to verify each performance and/or environmental requirement and whether verification is conducted on test modules or flight hardware/software. Included should be descriptions of the allocations of requirements to suballocated requirements, and to verifications of all requirements. Data package and presentation emphasis shall be placed on requirements that are verified by a combination of analysis and test, the portions of analyses that are required to be test verified, and model correlation plans.

CCR 4226C MOD 49





| DATA IT  | EM DESCRIPTION                                    | 2. NUMBER | SE-2.4-11 |
|----------|---|-----------|-----------|
| 1. TITLE | INR System Verification Review (SVR) Data Package | 3. DATE   | 8/26/97   |

The contractor shall convene a INR System Verification Review (INR SVR) to present the integrated INR System Test Plan. The test plan shall describe the schedule and organization of INR verification activities, and provide a matrix that maps INR requirements to its verification activity. The review shall discuss the individual test plans and configurations for the system verification activities defined in S-415-22 paragraph 3.4.4.3 (INR Pre-launch Spacecraft Test Requirements).

### 5. DATA REQUIREMENTS.

The review package shall, at a minimum, include a summary of the INR System Verification Test Plan, a description of the schedule and responsible organizational assignments of the INR verification activities, a matrix that maps INR requirements to its specific verification activity, and the analysis summaries and test plans for all INR verification activities.

### 6. SPECIAL PREPARATION INSTRUCTIONS

CCR 4226C MOD 49





| DATA     | A ITEM DESCRIPTION        | 2. NUMBER | SE-2.5-01 |
|----------|---------------------------|-----------|-----------|
| 1. TITLE | ESD & SEU Prevention Plan | 3. DATE   | 8/26/97   |

The plan will be used to evaluate the proposed design to ensure that data product outages due to Electrostatic Discharge (ESD) and Single Event Upsets (SEU) events are minimized.

### 5. DATA REQUIREMENTS

The Electrostatic Discharge (ESD) and Single Event Upset (SEU) Prevention Plan shall describe the following:

#### **ESD Prevention Plan**

Describe the planned design features that will be used to minimize the occurrence of ESD events in orbit.

# Single Event Upset Plan

Describe the planned design features that will be used to minimize the occurrence of SEUs, such as the use of any watchdog timer circuits, majority voting circuits, error detection circuits, etc.





| DATA     | ITEM DESCRIPTION        | 2. NUMBER | SE-2.5-02 |
|----------|-------------------------|-----------|-----------|
| 1. TITLE | Fields-of-View Analysis | 3. DATE   | 8/26/97   |

To support the optimization of the overall spacecraft configuration and to assure the complete compatibility of all fields-of-view (FOV).

# 5. DATE REQUIREMENTS

The contractor shall provide a complete fields-of-view (FOV) analysis of each instrument and sensor. The documentation shall include:

- 1. Derivation of the optimized configuration, location, and compatibility for each instrument, spacecraft sensor, solar array, exhaust plume, etc.
- 2. Fields-of-view analysis comparing the functional requirements to design.
- 3. FOV tolerances and errors.
- 4. Detailed quantitative descriptions of all objects within the fields-of-view.
- 5. Analysis of blockage disturbances and reflections including sun glint.

This documentation shall include trade-offs conducted for the optimization of the spacecraft configuration. Updates shall be generated to reflect test, measurement, and configuration changes.



| DATA     | ITEM DESCRIPTION           | 2. NUMBER | SE-2.5-03 |
|----------|----------------------------|-----------|-----------|
| 1. TITLE | EMC/EMI Compatibility Plan | 3. DATE   | 8/26/97   |

This document shall describe the design and test verification methods that will used to insure that the spacecraft will be compatible with the performance requirements.

### 5. DATA REQUIREMENTS

The EMC/EMI Compatibility Plan shall include the following minimum material.

- a. Description of how the spacecraft will be designed to ensure compatibility between the various subsystems, the launch vehicle, the GFE Imager, Sounder, and SXI instruments.
- b. Design and test plans that will be used at the system, subsystem and component levels.
- c. EMC/EMI test matrix that describes which components, and/or subsystems will be tested for Conducted Emissions, Conducted Susceptibility, Radiated Emissions, Radiated Susceptibility and Electrostatic Discharge.
- d. Description of the EMC/EMI and ESD Test Plans.
- e. Description of the proposed accept/reject test criteria that will be used at the system, subsystem and component levels of assembly.
- f. Description of proposed design guidelines that will be employed to ensure that the EMC/EMI requirements will be met, such as bonding, grounding and isolation, wiring harnesses design, EED circuits, shielding, etc.
- g. Describe the plan for providing the predicted and measured values of the S/C radiation interference levels at GFE instrument locations such as the optical apertures of the Imager, Sounder and SXI and the Imager and Sounder cooler apertures.

# 6. SPECIAL PREPARATION INSTRUCTIONS

The scope of this document shall include the satellite, instruments, and associated ground support equipment.





| DATA     | A ITEM DESCRIPTION          | 2. NUMBER | SE-2.5-04 |
|----------|-----------------------------|-----------|-----------|
| 1. TITLE | Schematics & Block Diagrams | 3. DATE   | 8/26/97   |

To provide reduced size drawings of system hardware, circuitry, and functions. Drawings will be used for problem tracing and procedure review.

# 5. DATA REQUIREMENTS

The documentation may be in the contractor's format. Electrical block diagrams, as a minimum, shall include:

- a. Overall system diagrams
- b. Diagrams, showing each function and interfaces with power, command, and telemetry.
- c. System level grounding diagram, including isolation resistance between all ground returns and a description of all interconnecting power returns, telemetry returns, signal returns, shielding terminations, and chassis grounds for each piece of equipment and for each instrument. The diagrams shall include all interfaces to test equipment connected to the spacecraft when the spacecraft is powered on.
- d. Combination block and schematic diagrams shall include relay switching, and pyrotechnic circuits.
- e. The reduced size schematics and block diagrams shall be provided in a three-ring notebook(s).





| DAT      | A ITEM DESCRIPTION                | 2. NUMBER | SE-2.5-05 |
|----------|-----------------------------------|-----------|-----------|
| 1. TITLE | Debris Generation Analysis Report | 3. DATE   | 8/26/97   |

This analysis is required to demonstrate compliance with the requirements of NASA Management Instruction (NMI) 1700.8 (April 5, 1993), and NSS 1740.14 dated August 1, 1995.

# 5. DATA REQUIREMENTS

A formal analysis shall be conducted and documented to assess orbital debris-generation potential and debris-mitigation options, including design options. The analysis shall include the following:

- 1. The potential for orbital debris generation in both nominal operation and malfunction conditions, including malfunctions during launch.
- 2. The potential for orbital debris generation due to on-orbit impact with existing space debris (natural or human-generated) or other orbiting space systems.

# 6. SPECIAL PREPARATION INSTRUCTIONS

NMI 1700.8 (April 5, 1993) NASA Safety Standard NSS 1740.14





| DAT      | A ITEM DESCRIPTION                              | 2. NUMBER | SE-2.5-07 |
|----------|---|-----------|-----------|
| 1. TITLE | Extended Life Analysis (8 operations/2 storage) | 3. DATE   | 5/07/03   |

This document is intended to provide a single point of reference for all the updates resulting from the extension of the in orbit mission life requirement from 2yr/5yr (Storage/Operational) to 2yr/8yr. The spacecraft contractor shall perform all the extended life analysis and develop the document to encompass all the analysis results noted in this CDRL data requirements (listed below).

# 5. DATA REQUIREMENTS

The Extended Life Analysis document shall address the changes that resulted from the extended life requirement. The document shall contain all the changes necessary for the following CDRLs.

CCR4353 Mod85

- a. SE-2.5-01 ESD/SEU Prevention Plan
- b. SE-2.5-06 Radiation Shielding and Dose Analysis Report
- c. SDA-3.2.3-01 Propulsion Performance Analysis Report
- d. SDA-3.2.4-01 Attitude Control Subsystem Performance Analysis Report
- e. SDA-3.2.5-01 Thermal Subsystem Performance Analysis Report
- f. SDA-3.2.6-01 Power Subsystem Analysis Report
- g. SDA-3.2.8-01 COMM Subsystem Performance Analysis Report
- h. SDA-3.2.9-01 Telemetry and Command Performance Analysis
- i SDA-3.2.10-01 Mechanisms Performance Analysis Report
- j. SDA-3.2.16-02 INR Related System Performance Report
- k. SE-2.5-05 Debris Generation Analysis Report
- I. SDA-3.2.17-01 Contamination Control Plan





| DATA     | A ITEM DESCRIPTION            | 2. NUMBER | SM-3.1.1-01 |
|----------|-------------------------------|-----------|-------------|
| 1. TITLE | Spacecraft Photographs/Videos | 3. DATE   | 8/26/97     |

To provide a detailed historical record of the electrical and mechanical assembly details for each spacecraft.

# 5. DATA REQUIREMENTS

# A. Photographs shall be taken of:

1. Appendage assemblies, separation mechanisms and configured component installations, showing critical mechanical configurations including cable routing and supports; mechanical mechanisms; pre- and post-thermal blanket installation

CCR 4226C MOD 49

- 2. Subsystem integration and test, documenting the flight hardware, as integrated on the spacecraft (e.g., propulsion system, power system-harnessing, etc.)
- 3. The spacecraft, its subsystems and components throughout various stages of spacecraft integration and test, documenting the flight hardware, system test configurations, and spacecraft handling activities
- B. The contractor shall provide still photography--one or more 5x7 (or larger) color prints of each of the following activities before final encapsulation, cover-up or final assembly, for the GOES N-Q spacecraft.

At a minimum, the following events shall be photographed during closeout operations at the S/C contractor's facility, as applicable (pre-shipment), and at launch base:

- 1. Final closeout at the S/C contractor's facility prior to shipping:
  - Interior of Spacecraft (S/C) prior to final closure
  - Exterior of the S/C
  - All deployable appendages, including hinges, hold-downs, insulation blankets near deployables, antennas, etc.
  - Exterior of S/C installed in shipping container prior to lid closure, including mounting points, purge lines, thermistors, accelerometers, etc.





| DATA     | ITEM DESCRIPTION                     | 2. NUMBER | SM-3.1.1-01 |
|----------|--------------------------------------|-----------|-------------|
| 1. TITLE | Spacecraft Photographs/Videos (Cont) | 3. DATE   | 8/26/97     |

# 5. DATA REQUIREMENTS - Cont.

#### 2. At the launch base:

- Exterior of the S/C upon receipt at the payload processing facility
- Interior of the S/C prior to aft barrier and DAB installation closeout
- Final stowage condition of all deployables prior to encapsulation into the launch vehicle (LV) fairing.
- Final condition of all antennas prior to LV encapsulation.
- Removal sites of all red tag items prior to LV encapsulation (including thruster covers, earth and sun sensors protective covers, lifting eye bolts, etc.)
- Exterior of the S/C prior to encapsulation
- Prior to LV fairing door closure on the pad, photograph the sites of any removed purged lines, electrical connections, etc.

These photographs and their negatives shall be retained by the contractor and be made available for review by the Government upon request. The contractor shall incorporate a detailed list(s) of photographs to be taken prior to the applicable phases discussed above, through shop orders, procedures, or Program-specific Quality Instructions.

### 6. SPECIAL PREPARATION INSTRUCTIONS

All photographs shall be annotated with information showing date, spacecraft, and unit identification.

Photographs shall be taken for each spacecraft.

Videos shall be taken of all deployment and dynamic environmental tests - with the exception of acoustic testing if CCTV is precluded due to facility constraints.

CCR 4226C MOD 49



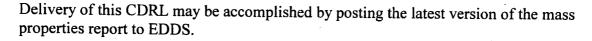


| DATA I   | TEM DESCRIPTION        | 2. NUMBER | SM-3.1.1-02 |
|----------|------------------------|-----------|-------------|
| 1. TITLE | Mass Properties Report | 3. DATE   | 8/26/97     |

To document all physical mass properties of the spacecraft, its subsystems and components from preliminary design through final assembly, launch and throughout all phases of the mission up to End of Life (EOL).

### 5. DATA REQUIREMENTS

This document shall provide a mass properties database for each spacecraft including the GFE instruments. Mass properties shall include mass, center of gravity, moments of inertia and products of inertia. The reports shall be based upon calculated values and shall be updated as calculations are revised and actual measured data becomes available. Following environmental testing and prior to the spacecraft shipment, the report shall contain a complete mass properties summary of the final spacecraft mass properties as measured. The report shall also include the appropriate mass contingency for the current stage of hardware development, along with the allocated mass allowable.



The mass properties report shall contain the following:

- a. An overall spacecraft mass summary, including total spacecraft dry mass, spacecraft subsystem dry mass, total spacecraft launch mass (including propellant), total spacecraft orbit insertion mass, and spacecraft mass at EOL
- b. A spacecraft mass properties summary for the various phases of the mission, including launch, deployments, separation, through EOL. This summary should also demonstrate mass changes due to propellant utilization throughout the mission through EOL
- c. A detailed mass properties summary of all spacecraft hardware organized by subsystem
- d. A summary of all mass properties changes incorporated into the spacecraft mass properties database since the last report.





| DATA     | ITEM DESCRIPTION     | 2. NUMBER | SM-3.1.1-03 |
|----------|----------------------|-----------|-------------|
| 1. TITLE | Power Profile Report | 3. DATE   | 8/26/97     |

To establish the detailed and current performance requirements and capabilities for the power subsystem in all modes and phases of operation.

To provide input data for the thermal mathematical models and for mission operations plans and procedures.

#### 5. DATA REQUIREMENTS

This documentation shall include all significant power loads for all significant phases of the mission from pre-launch (turn-on) operation through launch, transfer orbit, on-orbit storage, and orbital operation, including both sunlight orbit and eclipse orbit modes and phases.

Delivery of this CDRL may be accomplished by posting the latest version of the power profile report to EDDS.

The power consuming elements shall be broken down into, at least, the following:

- 1. The elements that are individually controlled by command or automatic program.
- 2. Individual boxes or stacks, where a stack of boxes operates in combination as a single power consuming unit.
- 3. Converter and transmission losses.

Power consumption shall be broken down into, at least, the following categories:

- 1. Maximum operating, minimum operating and orbital average power values, including specific descriptions regarding duty cycles shall be provided.
- 2. In-rush current peaks and peak transient current events shall be identified.

The source and basis for the estimate (e.g., design estimate, bread board estimate, exact previous hardware measurement, etc.) of the data used to define the dissipation of each load shall be explicitly identified.

Solar array current and battery performance and margins shall be provided along with source and descriptors for the data.



The power profile report shall describe the power requirements for each satellite mode of operation that is described in the S-415-22 Performance Specification.



| DATA     | ITEM DESCRIPTION            | 2. NUMBER | SM-3.1.1-03 |
|----------|-----------------------------|-----------|-------------|
| 1. TITLE | Power Profile Report (Cont) | 3. DATE   | 8/26/97     |

# 6. SPECIAL PREPARATION INSTRUCTIONS

Detailed power profiles shall be presented, to the maximum extent possible, in both tabular and graphical form.

This document shall be updated for each spacecraft as parameters change.







| DATA ITEM DESCRIPTION |  | 2. NUMBER | SDA-3.2.1-01 |
|-----------------------|--|-----------|--------------|
| 1. TITLE              | Component and Subsystem Design<br>Specifications | 3. DATE   | 8/26/97      |

The component and subsystem design specifications shall be used to define the performance, design, and test verification requirements for all spacecraft component and subsystems.

## 5. DATA REQUIREMENTS

The contractor shall provide specifications for each spacecraft component and subsystem in accordance with the specification tree. A specification tree shall be provided that identifies the top level S/C design specification and all lower level design specifications. The subsystem specifications shall include, but not be limited to, the following items:

- a. Performance requirements and capabilities (may be provided for informational purposes)
- b. Subsystem and/or component mechanical and electrical interfaces.
- c. Performance verification requirements
- d. Performance assurance requirements
- e. Grounding and shielding plan
- f. Radiation design requirements
- g. Functional and/or block diagram(s)
- h. Component specification requirements

#### 6. SPECIAL PREPARATION INSTRUCTIONS

The Component and Subsystem Design Specifications shall be in accordance with MIL-STD-490, or the contractor's equivalent format.





| DATA     | ITEM DESCRIPTION                             | 2. NUMBER | SDA-3.2.1-02 |
|----------|--|-----------|--------------|
| 1. TITLE | Subsystem & Component Review Data<br>Package | 3. DATE   | 8/26/97      |

Presents the design and operations and interface aspects to convey the overall status of the Subsystem or Component.

### 5. DATA REQUIREMENTS

The Preliminary and Critical design reviews for the Subsystem and Components shall provide a detailed overview of the design and operation of the subsystem/component under review. Details of the review package content shall be mutually agreed to prior to the specific review, but as a minimum the data package shall include:

- a. Current status of the design, development and test programs associated with the subsystem/component.
- b. Presentation of the details for each subsystem component, subsystem architecture, results of all studies, analysis, simulations and tests, problems and issues associated with the program, including plans for resolution of the problems and/or issues, and schedule considerations
- c. Agenda
- d. Copies of responses to action items and recommendations generated at prior reviews
- e. Presentation material (e.g., view graph copies) for the subject review
- f. Analyses and reports required at the review
- g. Supportive material. Where supportive material has been submitted prior to or concurrent with this requirement, such material may be incorporated within this requirement by reference
- h. Failure report summaries (if any) including status of action and rationale for closure

### 6. SPECIAL PREPARATION INSTRUCTIONS

The contractor shall prepare and provide a response for each recommendation and action item that is submitted by the review committee during the review.





| DAT      | A ITEM DESCRIPTION  | 2. NUMBER | SDA-3.2.2-01 |
|----------|---|-----------|--------------|
| 1. TITLE | Structural and Mechanical Subsystem Performance Analysis Report | 3. DATE   | 8/26/97      |

To document the analyses and data which demonstrate that all structural and mechanical subsystem performance requirements are satisfied.

# 5. DATA REQUIREMENTS

For each spacecraft, this data item shall contain the following:

<u>Design limit loads</u>: This data item shall define the spacecraft design limit loads. The philosophy used in the derivation of the design limit loads shall be described in detail. Factors of safety and uncertainty factors applied to or utilized in the development of the design limits loads shall also be addressed.

<u>Flight loads analyses:</u> This data item shall provide spacecraft and GFE instrument flight loads analysis data and results, for each flight loads analysis performed either by the spacecraft contractor or by the launch vehicle contractor.

<u>Spacecraft alignment and stiffness:</u> This data item shall document the analyses, tests and test data required to verify all spacecraft alignment and stiffness requirements. The document shall also address spacecraft mechanical design verification with respect to dynamic interactions with the launch vehicle and GFE instruments.

Spacecraft clearances: This data item shall document all spacecraft critical clearances and loss of clearances, with the associated analyses. This shall include dynamic loss of clearance between the spacecraft including GFE instruments and the launch vehicle, and between various spacecraft elements. Clearance loss shall be determined for critical clearances throughout all mission phases, including launch, on-orbit deployments and on-orbit operations. Components contributing to each clearance loss, such as manufacturing and assembly tolerances, clearance loss due to spacecraft dynamics and thermal gradients, as well as spacecraft insulation, harnesses and grounding provisions, shall be quantified. Analytical and measured data used for clearance verification shall be provided.

Mechanical performance: This data item shall fully document the tests and analyses performed to verify the performance of the spacecraft mechanisms and deployment devices. Analyses and test data used to verify the spacecraft structural performance and workmanship shall also be provided. This document shall also address any methods utilized during fabrication and assembly which verify workmanship of the spacecraft structure and mechanical components.





| DATA     | A ITEM DESCRIPTION   | 2. NUMBER | SDA-3.2.2-01 |
|----------|--|-----------|--------------|
| 1. TITLE | Structural and Mechanical Subsystem Performance Analysis Report (Cont) | 3. DATE   | 8/26/97      |

### 5. DATA REQUIREMENTS - Cont.

<u>Force and/or Torque Margin Analysis:</u> This data item shall include force and/or torque margin analysis and test data for all spacecraft deployables and mechanisms.

On-Orbit Thermal Distortion: This data item shall provide INR performance analysis data from on-orbit thermal distortion analysis.

For the submittal at the subsystem PDR, the material will be comprised of:

- Dynamic load requirement flow chart.
- Summary of the models/analyses used to determine the mechanical behavior of the structure.
- Spacecraft stiffness requirements.
- Summary of the validation test performed or planned to correlate the model.
- Design loads tables.
- Alignment budget (preliminary).
- Dynamic loss of clearance.
- Comparison of requirements against analysis results.
- Description of in-process testing requirements (proofload of bonded joints).

#### 6. SPECIAL PREPARATION INSTRUCTIONS

This submittal may be comprised of selective charts from the Structure Subsystem design review package supplemented by more detailed data sheets, if required for clarity and technical support.







| DATA     | A ITEM DESCRIPTION   | 2. NUMBER | SDA-3.2.2-02 |
|----------|--|-----------|--------------|
| 1. TITLE | Structural and Dynamic Models and Model<br>Verification Plan | 3. DATE   | 8/26/97      |

To provide test verified mathematical models that represent the static and dynamic structural characteristics of the spacecraft and can be utilized with other data to predict structural accelerations, deflections, and internal loads. Also, to provide the dynamic model for use by the launch vehicle contractor in the performance of the flight loads analyses.

Item 5D (below) shall be used by NASA to evaluate the on-orbit structural accelerations and dynamic interactions. This model will be quite different than the model for launch condition.

# 5. DATA REQUIREMENTS

# A. <u>STRUCTURAL AND DYNAMIC MATHEMATICAL MODELS AND DOCUMENTATION</u>

The contractor shall develop and document test-verified mathematical structural models of the spacecraft in the launch configuration. These shall include a structural finite element model and a dynamic model in Craig-Bampton form, developed, verified, and documented as described below. The finite element model shall represent the structural and dynamic characteristics of the spacecraft. Interface degrees of freedom shall be compatible with corresponding attachment degrees of freedom on the model of the launch vehicle. The dynamics model shall be based on the finite element structural model using standard reduction techniques such as Craig-Bampton reduction.

The test verified structural finite element models and dynamic models shall be provided on electronic medium in a format acceptable to the launch vehicle contractor for the performance of the verification loads cycle analysis.

# The dynamic models shall:

- a. Include the overall system (spacecraft and components),
- b. Be in Craig-Bampton form with modes that represent the dynamic characteristics of the spacecraft to at least 100 Hz,
- c. Define dynamic degrees of freedom to allow calculation of acceleration levels and relative deflections at critical points, and
- d. Include Load Transformation Matrices (LTM) described in the next section.





| DAT      | A ITEM DESCRIPTION   | 2. NUMBER | SDA-3.2.2-02 |
|----------|--|-----------|--------------|
| 1. TITLE | Structural and Dynamic Models and Model Verification Plan (Cont) | 3. DATE   | 8/26/97      |

# 5. DATA REQUIREMENTS - Cont.

The finite element model documentation shall include the following:

a. A listing of the input data for the model,

- b. Model definition plots, coordinate system definition, mass properties, and any other pertinent model definition information, along with documentation of the correlation between the modeled properties and the spacecraft design (GFE instrument models will be provided by their subcontractors),
- c. Mode shapes, frequencies, modal damping, modal participation factors, modal effective weights, correlation between analytical and test modes, and all data required to demonstrate test-verification of the models
- d. Characterization of all significant frequencies and mode shapes for the spacecraft constrained at the launch vehicle boundary points.

# B. LOAD TRANSFORMATION MATRICES (LTM's)

The Load Transformation Matrices shall be fully documented and provided on electronic medium in a format acceptable to the launch vehicle contractor. The LTMs shall:

- a. Consist of influence coefficients relating selected output variables to the associated dynamics model response variable,
- b. Include launch vehicle interface reaction forces, component/spacecraft interface reaction forces, and reaction force at support locations for deployables,
- c. Include force, shear, and moment coefficients for determining internal loads in critical structural members, and
- d. Include coefficients for determining absolute and relative deflections of spacecraft internal elements.

# The LTM documentation shall provide:

- a. A description of the model(s) from which the LTMs were generated,
- b. A description of each row of the LTM,
- c. Instructions for use of the LTM, including discussion of the equations used for computing internal transient loads, and
- d. Results of standard checks performed for verification of the LTM (e.g., response to 1g accelerations and unit displacements at the interface).



| DATA     | A ITEM DESCRIPTION   | 2. NUMBER | SDA-3.2.2-02 |
|----------|--|-----------|--------------|
| 1. TITLE | Structural and Dynamic Models and Model Verification Plan (Cont) | 3. DATE   | 8/26/97      |

5. DATA REQUIREMENTS - Cont.

# C. STRUCTURAL MODEL VERIFICATION PLAN

In support of the development of the test-verified structural models, the contractor shall develop a verification plan which includes:

- a. Identification of the modeling techniques and analysis programs to be utilized,
- b. Analytical and testing techniques to be used to verify the analytical models and, where required, plans for revising models and repeating analyses based on verification results,
- c. A description of analyses to be performed, along with the objective, scope, and output of each analyses, and description of testing which will be used for model verification, and
- d. A compilation of required loads interface data (e.g., loads to components or deployables, or loads from launch vehicle(s), etc.), and a schedule of need dates.

# D. <u>ON-ORBIT INTERACTIONS</u>

Repeat item "A" above for fully deployed, on orbit operating conditions and milli-g level vibrations.

# 6. SPECIAL PREPARATION INSTRUCTIONS

For items 5A thru 5C, all models, simulations, and/or databases required by this DID shall be delivered on magnetic media compatible with the hardware platform on which it is to execute and include everything necessary to provide a fully functioning computer model whose execution requires only commercially available hardware and software.

For item 5D, all analysis, simulations, and/or databases for this report shall be available for review at the contractor's facilities.

The GFE instrument structural models shall be incorporated in the spacecraft model and all analyses shall include the instruments.

Part 1 is to be provided at subsystem PDR and Part 2 one month after submittal of PLAC model to the launch vehicle contractor. The planned date for Part 2 is 10/1/98.





| DAT      | A ITEM DESCRIPTION | 2. NUMBER | SDA-3.2.2-03 |
|----------|--------------------|-----------|--------------|
| 1. TITLE | Stress Analysis    | 3. DATE   | 8/26/97      |

To provide a detailed stress analysis and margins of safety calculations for all structural components in the spacecraft.

#### 5. DATA REQUIREMENTS

The contractor shall provide a detailed hand, in contrast to "shorthand" stress analysis and margins of safety calculations for all components of the spacecraft including the GFE instruments. Margins of Safety shall be summarized in tabular form, providing a description of each structural element, its critical loading condition, including thermal and mechanical loading, failure mode, margin of safety, and reference to the detailed analysis. Primary load-paths shall be identified and all simplifying assumptions clearly stated. If separate finite element models are developed for use in analyzing structural components, these models shall also be documented and included in the final stress report. The documentation shall also include any parametric studies and analyses directed toward minimizing component loads and stresses.

All important structural requirements shall be assembled and provided in conjunction with the stress analysis report. It shall serve as the source for design loads, flight loads, frequencies, mass properties, stresses, deformations, margins of safety and information which defines the structural materials such as alloy type, strength, heat treatment, hardness, chemical treatment, finish, and other physical properties that have an influence on structural analysis. It shall also address the structural requirements of the launch vehicle that are related to the spacecraft.

The submittal at subsystem PDR will represent a preliminary analysis report which will contain the following:

- A summary of the analyses performed to date.
- Spacecraft stiffness requirements.
- A summary of the validation test performed or planned to correlate the model.
- Design loads tables.
- Design margins of safety table.

#### Stress Report Updates

For each spacecraft, the stress analyses shall be provided to verify margins of safety using the design coupled flight loads analysis results. The stress analyses shall be updated and provided using the verification coupled flight loads analysis results, to verify that modifications to the structural models to achieve correlation with modal test data and hardware modifications encountered during spacecraft manufacturing and integration maintain positive margins of safety.

#### 6. SPECIAL PREPARATION INSTRUCTIONS

This submittal may be comprised of selective charts from the Structure Subsystem design review package supplemented by more detailed data sheets, if required for clarity and technical support.



| DATA     | A ITEM DESCRIPTION                                    | 2. NUMBER | SDA-3.2.2-04 |
|----------|---|-----------|--------------|
| 1. TITLE | Thermal Distortion Models and Model Verification Plan | 3. DATE   | 8/26/97      |

To provide mathematical models representing the changes in Imager and Sounder pointing due to the combined thermal characteristics of the spacecraft and instrument distortions. The models will be used to predict INR performance of the instruments when exposed to on-orbit thermal environments.

# 5. DATA REQUIREMENTS

The contractor shall develop and document a finite element model of the spacecraft in the orbit configuration suitable for predicting distortions due to on-orbit thermal conditions. The Imager and Sounder interfaces shall be represented in such a manner as to allow the coupling of their thermal distortion models.

The finite element model documentation shall include the following:

- a. A listing of the input data for the model, including thermal model data such as spacecraft configuration, orbital conditions, and optical properties used to generate temperatures.
- b. If generated from an existing structural finite element model, statement of which structural finite model was modified for thermal distortion analysis and what modifications were made
- c. If generated independently, model definition plots, coordinate system definition, definition of stiffness properties, and any other pertinent model definition information
- d. Results of model validation check analysis

# 6. SPECIAL PREPARATION INSTRUCTIONS

GFE instrument thermal distortion models will be provided by the Government and shall be incorporated into the spacecraft model, by the spacecraft contractor.



| DATA     | A ITEM DESCRIPTION                                  | 2. NUMBER | SDA-3.2.3-01 |
|----------|---|-----------|--------------|
| 1. TITLE | Propulsion Subsystem Performance Analysis<br>Report | 1         | 8/26/97      |

To document and verify that the Propulsion Subsystem design will satisfy the required performance criteria and will meet overall mission objectives.

# DATA REQUIREMENTS

The propulsion Subsystem Analyses Report shall include, but not be limited to, the following analyses:

- a. Propulsion performance for the following mission functions:
  - 1. Placing GOES N spacecraft in geosynchronous orbit
  - 2. East-West and North-South station keeping
  - 3. Required on-orbit repositioning maneuvers
  - 4. Injection into end-of-life orbit

For each function address the following:

- Maximum and minimum firing duration
- Maximum and minimum thrust level
- Thrust vector misalignment tolerance
- Number of engine starts
- Total impulse required
- Thruster duty cycles
- b. Propulsion performance for attitude control including the following:
  - Effects of thruster vector misalignment tolerance and CG shift on ACS limit cycle
  - 2. Maximum and minimum firing duration
  - 3. Maximum and minimum thrust levels
  - 4. Total impulse required for attitude control
  - 5. Thruster duty cycles
- c. Propulsion performance for any failure mode in the propulsion subsystem or other spacecraft which has an impact on propellant consumption or thruster usage. The failure modes should address the following:

| DAT      | A ITEM DESCRIPTION   | 2. NUMBER | SDA-3.2.3-01 |
|----------|--|-----------|--------------|
| 1. TITLE | Propulsion Subsystem Performance Analysis<br>Report (Cont) | 3. DATE   | 8/26/97      |

# 5. DATA REQUIREMENTS - Cont.

- 1. Ascent phase
- 2. On-orbit phase
- 3. Acquisition mode
- 4. Roll/Yaw momentum dumping
- 5. East-West and North-South station keeping

# For each function address the following:

- Operational scenario
- Operational constraints
- Propellant penalty for each scenario
- d. Detailed propellant requirements budget for each mission function including all system inefficiencies, system pressure drop, and thrust decay over mission life
- e. The propulsion subsystem report shall also include, but not be limited to, the following analyses:
  - 1. Stress/loads
  - 2. Power
  - 3. Thermal
  - 4. Contamination/plume impingement
  - 5. Slosh
  - 6. Pressure surge
  - 7. Telemetry and Command interfaces
- f. Subsystem operation scenario and time line to include system utilization during launch to orbit phase.



| DATA     | ITEM DESCRIPTION   | 2. NUMBER | SDA-3.2.4-01 |
|----------|--|-----------|--------------|
| 1. TITLE | Attitude Control Subsystem (ACS) Performance Analysis Report | 3. DATE   | 8/26/97      |

To provide documentation that describes the ACS design and verifies that it will satisfy all ACS requirements and will successfully support all relevant mission objectives.

#### 5. DATA REQUIREMENTS

This document shall include design descriptions, analyses, simulations, and test data to verify that the ACS design satisfies all relevant requirements. It shall include the following, as a minimum:

- a. Attitude Control Subsystem (ACS) requirements compliance matrix, showing how each subsystem-level requirement will be verified.
- b. Instrument error budget(s) to show all contributions to subsystem end-to-end pointing and stability errors (ACS sensors to instrument mounting interfaces), both control and knowledge. Description and justification of the method of combining errors. For each error source, provide (in a separate list, if desired):
  - 1. Error magnitude and basis of estimate
  - 2. Frequency content (order of magnitude)
  - 3. Whether the error will be observable and separable on-orbit and if not what combination of ground testing, analysis, and indirect on-orbit measurements demonstrate that the source is within its allocation..
- c. ACS component and subsystem alignment including:
  - 1. Definition of all relevant coordinate frames, and identification of the master reference frame
  - 2. Alignment measurement method and accuracy
  - 3. Measured alignment matrices
- d. ACS analyses and simulations. For each ACS mode, provide the following, as a minimum:
  - 1. Description of mode, including derived requirements, transitions into and out of the mode, block diagram showing transfer functions for all hardware and software components.
  - 2. Analyses and simulations that verify that the mode meets all derived functional and performance requirements. This includes verification of system performance in response to internal and external disturbance torques, and uncompensated momentum.
  - 3. Rigid and flexible-body stability margins for each hardware signal path yielding a unique open-loop transfer function.
  - 4. Sensitivity analysis and/or simulations for key parameters.







| DATA I   | TEM DESCRIPTION   | 2. NUMBER | SDA-3.2.4-01 |
|----------|---|-----------|--------------|
| 1. TITLE | Attitude Control Subsystem (ACS) Performance Analysis Report (Cont) | 3. DATE   | 8/26/97      |

# 5. DATA REQUIREMENTS - Cont.

- e. Definition, analyses, and simulations of the momentum management system.
- f. Definition of ACS Fault Detection and Correction, including a list of faults detected on-board and the corresponding on-board and ground actions. Analysis and simulations demonstrating system behavior in failure scenarios, with both detected and undetected faults.
- g. Definition of ACS computer support requirements, such as computational throughput, memory capacity, etc.
- h. Analyses and simulations of solar array pointing and control functions, including definition of disturbances generated by the drive system and the flexible characteristics of the solar array.
- i. Define all test points required to support the ACS tests at the component, subsystem and Spacecraft levels of assembly.





| DATA I   | TEM DESCRIPTION                                     | 2. NUMBER | SDA-3.2.4-02 |
|----------|---|-----------|--------------|
| 1. TITLE | Attitude Control Subsystem (ACS) Detail Description | 3. DATE   | 8/26/97      |

This document shall provide a detailed description of the ACS and its interfaces with the other Spacecraft subsystems. The information will be used to understand the ACS design, evaluate anomalies encountered during the ACS and Spacecraft level tests, and provide operations personnel with the necessary understanding of the operational capabilities and constraints associated with the ACS.

# 5. DATA REQUIREMENTS

This document shall provide the following information, as a minimum:

- a. Definition of all firmware/software associated with the ACS, including that resident in any computer/processor internal or external to the ACS. This shall include all applicable code and flow diagrams.
- b. Detailed block diagrams and electrical schematics of all ACS equipment
- c. Detailed descriptions and performance characteristics of all attitude sensors and control actuators, including processing and drive electronics
- d. Definition of interfaces with other Spacecraft subsystems and payload instruments
- e. Definition of all ACS command and telemetry functions, including telemetry sample rates
- f. Other documentation necessary to operate and/or diagnose anomalous ACS performance





| DATA ITEM DESCRIPTION |   | 2. NUMBER | SDA-3.2.5-01 |
|-----------------------|---|-----------|--------------|
| 1. TITLE              | Thermal Subsystem Performance and Analysis Report | 3. DATE   | 8/26/97      |

To evaluate the adequacy of the thermal design.

#### DATA REQUIREMENTS

These reports shall include, at least, the following items:

- 1. Complete list of S/C and Instrument component Qualification Temperatures (Imager, Sounder, Instrument of Opportunity (IOO), and SXI excluded).
- 2. Complete list of S/C and Instrument component Acceptance Temperatures (Imager, Sounder, IOO and SXI excluded).
- 3. Complete list of S/C and Instrument component Mission Allowable Temperatures (Imager, Sounder, IOO, and SXI excluded).
- 4. Beginning and end of life temperature and required heater power predictions for all S/C and Instrument components including the Imager, Sounder, IOO, and SXI instruments, and all flight thermistors during summer solstice, winter solstice, N 8.7°, S 8.7°, equinox, equinox eclipse and on-orbit storage. The temperature and heater power predictions are to include the launch phase prior to all-up operation at synchronous altitude.
- 5. Temperature predictions shall include the wetted portions of the propulsion system in all possible flight conditions including eclipse.
- 6. Comparison tables of predicted temperatures vs. Mission Allowable, Acceptance and Qualification Temperatures for each spacecraft and instrument component.
- 7. List and description of all thermal engineering assumptions and parameters (i.e., detailed power distribution breakdown, solar absorptances, emittances, solar and Earth's albedo inputs, etc.) that are used in the thermal analyses.
- 8. Uncertainties in temperature that were included in the temperature predictions shown in item 4 and a detailed description of how they were determined.
- 9. Definition of all flight thermal sensors and their locations by description and by drawing.
- 10. Applicable test data and flight data that helps substantiate and correlate the analytical nodal models used to make temperature predictions.





CCR4353C Mod85



| DATA ITEM DESCRIPTION |                     | 2. NUMBER | SDA-3.2.5-02 |
|-----------------------|---------------------|-----------|--------------|
| 1. TITLE              | Thermal Math Models | 3. DATE   | 8/26/97      |

To provide for the comprehensive, detailed review and validation of the thermal design and to predict the thermal performance of the spacecraft and instruments in all modes of operation.

### 5. DATA REQUIREMENTS

The requirements and guidelines for the Combined Comprehensive S/C- Instrument Analytical Thermal Model is described below:

The Combined Comprehensive S/C-Instrument thermal model is a mathematical representation of the heat transfer between the s/c, the instruments and the environment. This model shall accurately predict the heat flows and the resulting temperature changes for any alteration in the environment, internal power dissipation, or any other thermal model parameter. The mathematical representation shall consist of a geometric math model (GMM), with which radiation couplings and environmental heat fluxes are calculated, and a thermal math model (TMM), which calculates the heat transfer and resultant temperatures.

The requirements for the Geometric and Thermal Math Model are described below:

Provide a list of all nodes with nodal descriptions. Sketches showing how nodes correspond to s/c Instrument components shall be included. Describe each node of the TMM, its correspondence to a surface or surfaces of the GMM, and discuss the nodalization rationale and how accurately the nodalization thermally represents the actual s/c Instrument hardware.

#### 6. SPECIAL PREPARATION INSTRUCTIONS

The GFE instrument thermal models shall be incorporated into the spacecraft model by the contractor. All S/C thermal analyses shall include the GFE models.



| DATA I   | TEM DESCRIPTION                 | 2. NUMBER | SDA-3.2.6-01 |
|----------|---------------------------------|-----------|--------------|
| 1. TITLE | Power Subsystem Analysis Report | 3. DATE   | 8/26/97      |

Provides analysis of the power subsystem implementation to show that the design fulfills the mission requirements for all modes of operation.

### 5. DATA REQUIREMENTS

The power subsystem analyses shall be documented for all modes of operation in a power subsystem analysis technical report. The report shall include, but not be limited to:

- a. Solar array performance analysis for all anticipated modes of operation.
- b. Battery performance analysis for all anticipated modes of operation.
- c. Power distribution and regulation analysis for all steady state and transient conditions.
- d. Power subsystem electrical performance characterization analyses for all anticipated modes of operation.
- e. Overload/fault suppression requirements, and the methods used to meet the requirements.
- f. Analysis of power subsystem interaction with external sources, such as GSE and launch vehicle, for steady state and transient conditions.
- g. Energy Balance computational analysis for all anticipated modes of operation.
- h. EMI/EMC requirements and analysis of methods used to meet requirements for each component.
- i. All power subsystem Telemetry and Command functions and interfaces.
- j. Block diagrams.
- k. Description of components.
- 1. Reliability assessment.
- m. A requirements verification matrix.
- n. Description of pre-launch, transfer orbit, on-orbit storage, and on-orbit operational considerations.
- o. Description of fuse location, size, derating criteria, and fuse testability during S/C level testing.
- p. Describe the power requirements for each satellite mode of operation that is described in the S-415-22 Performance Specification.



| DATA IT  | EM DESCRIPTION  | 2. NUMBER | SDA-3.2.8-01 |
|----------|---|-----------|--------------|
| 1. TITLE | Communications Subsystem Performance<br>Analysis Report | 3. DATE   | 8/26/97      |

This report shall provide the Bit Error Rate (BER) degradation analyses and modeling, and link calculations required to demonstrate the GOES N-Q communications subsystem meets all the performance requirements. This report shall also describe the data reduction method. Each verification test signal path measurement error budget shall be calculated. An automated test equipment block diagram showing the test signal paths between test components, switches, attenuators, gain and mixer stages shall be provided. This report shall consist of a series of technical memos, each written throughout the development of the GOES N-Q series.

### 5. DATA REQUIREMENTS

The contractor shall provide a GOES N Spacecraft Communications Subsystem Performance Analysis report that describes and presents in detail the predicted performance of the spacecraft communication subsystem and link margins. The report shall contain, as a minimum, narrative, model data and analysis, where appropriate, addressing the following subjects as they pertain to the On-orbit Communications Subsystem functions. Link margins shall be calculated with the CCSDS RF Modulation Standard as a guide.

- a. Transmission channel distortions and impairment analysis shall include: center frequency, signal path gain distribution, dynamic range, RF bandwidth, G/T, channel isolation, overload protection, AGC performance, phase linearity, gain flatness, carrier phase noise, AM/AM and AM/PM conversion, spurious PM, incidental AM, EIRP, axial ratio, C/N, spurious outputs, frequency stability, noise figure, time delay, active and passive intermodulation and BER.
- b. The following technical performance parameters of the GOES N Spacecraft communications subsystem hardware, including gain, loss, bandwidth, noise temperature, amplifier power, and EIRP shall be presented in tabular form. The gain/loss tabulation shall include as a minimum each connector, waveguide section, flange VSWR, diplexer loss, switch loss, SIT pads, amplifier gain and power, amplifier backoff, transmit and receive antenna gains, EIRP, pre-amp gain, VSWR effects and pre-amp and transponder noise temperature calculation. The document shall provide separately the tolerance of each channel or service parameter, and BOL/EOL margins shall be shown. The RF portion of the command and telemetry functions shall be included. The tabulated data shall also be delivered in Excel spreadsheet compatible files with the applicable formulas.
- c. Operating modes and configurations.
- d. Analyze the frequency and channelization plan and provide analyses determining self-interference, mutual interference, cross channel interference, filter and isolation





requirements with the on-orbit antennas field of view predictions.





| DATA IT  | TEM DESCRIPTION   | 2. NUMBER | SDA-3.2.8-01 |
|----------|---|-----------|--------------|
| 1. TITLE | Communications Subsystem Performance<br>Analysis Report (Cont.) | 3. DATE   | 8/26/97      |

### 5. DATA REQUIREMENTS - Cont.

e. Analyze the BER degradation due to digital transmission channel impairments such as filters, linearity effects (e.g., intermodulation noise, AM/PM conversion) and spurious signals.

The contractor shall describe and present in detail the performance of each Communication Subsystem and T & C Subsystem verification test method and the hardware and software implementation. The report shall contain, as a minimum, narrative, software verification test data and analysis, addressing each verification test.

Analysis efforts shall include showing that each signal path used for each measurement has proper bandwidth, power levels, and signal-to-noise ratios at each sensors most accurate range of measurement. The calibration error budget shall be determined and a measurement accuracy analysis completed. Measurement accuracy may be demonstrated via testing.



The contractor shall provide GOES N Spacecraft Communications and T & C Subsystems Automated Test Equipment (ATE) equipment hardware drawings that describe and present in detail the component interconnections, signal routing paths, and command, control, and data acquisition interfaces. These drawings shall document both the electrical and mechanical configurations and include the complete signal pathways to the spacecraft.





| DATA IT  | EM DESCRIPTION   | 2. NUMBER | SDA-3.2.8-02 |
|----------|--|-----------|--------------|
| 1. TITLE | Communications Subsystem Component<br>Computer Simulation Models | 3. DATE   | 8/26/97      |

This deliverable shall provide predicted and measured (when available) data that represents the predicted and measured linear and nonlinear performance of each GOES N-Q communications subsystem component. NASA shall use this data for transmission channel modeling to validate the spacecraft design and to evaluate the mission operations until EOL.

### 5. DATA REQUIREMENTS

The contractor shall provide GOES N-Q Spacecraft Communications Subsystem component models that describes the predicted and measured performance of each Communication Subsystem component over temperature. The items shall be delivered once and again to update each change in either the communications or T & C subsystem. The models shall be at least raw tabulated printout data or preferably electronic standard format files representing the transfer function of the components time or frequency domain performance, including but not restricted to the following:

Analytical computer modeling or equivalent data for Design Verification:

- a. Receiver and transmitter gain transfer curves.
- b. Channelization and multiplexer filters data over frequency.
- c. Spacecraft transfer orbit ephemeris predictions (position and attitude) from launch to arrival at the orbital station. This data shall be in the form XYZ coordinates in an inertial earth centered reference frame, using the WGS-84 earth model, and be delivered in an electronic standard format.
- d. Predicted on-orbit communications and T&C transfer orbit antenna patterns.
- e. Measured Data for Performance Verification of Engineering Model or First Article Flight Model will be provided for all communications RF electronic engineering model builds.



| DATA IT  | TEM DESCRIPTION   | 2. NUMBER | SDA-3.2.8-02 |
|----------|---|-----------|--------------|
| 1. TITLE | Communications Subsystem Component Computer Simulation Models (Cont.) | 3. DATE   | 8/26/97      |

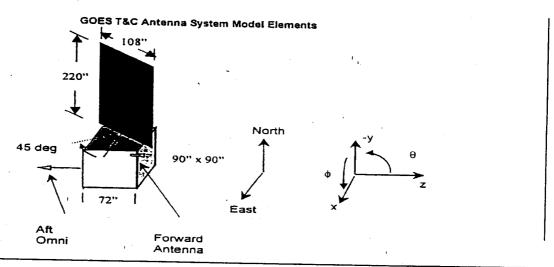
# 5. DATA REQUIREMENTS - Cont.

f. Predicted on-orbit antenna coverage and polarization patterns shall be performed with no greater than 1 degree increment over twice the on-orbit coverage range with the spacecraft configured in the on-orbit configuration (deployables deployed).

g. Composite coverage and polarization patterns for the T&C antenna system, made up of more than one discrete radiating element, shall be provided. Composite patterns may be derived analytically using the Geometric Theory of Diffraction modeling tool. The amplitude and phase measurements of each discrete radiating element shall be used as model inputs. The modeling may use representative elements and scattering structures of the satellite in flight configuration. As shown in the figure, the modeling may represent the satellite by a box for the bus and a plate for the solar array. The composite patterns shall have angular increments no greater than 1 degree. For a single TT&C antenna, the measurement increments shall be no greater than 2 degrees along the axis of greatest variation.

CCR 6080 MOD 62

All antenna patterns shall be performed at the assigned operating frequency or at lower edge and upper edge for antennas which provide for multiple carriers. Each antenna pattern data shall be referenced to an isotropic antenna and the spacecraft axis. All antenna pattern data shall be delivered in a standard electronic format. This data shall also include a tabulated antenna pattern printout.



CCR 6080 MOD 62

| DATA IT  | TEM DESCRIPTION                          | 2. NUMBER | SDA-3.2.9-01 |
|----------|--|-----------|--------------|
| 1. TITLE | Telemetry & Command Performance Analysis | 3. DATE   | 8/26/97      |

This report shall provide the analyses and data required to demonstrate the GOES N-Q T & C subsystem meets all the performance and ground station compatibility requirements. This report shall also describe each verification and compatibility test procedure, algorithm, and data reduction method. Each test signal path measurement error budget shall be calculated. An automated test equipment block diagram showing the test signal paths between test components, switches, attenuators, gain and mixer stages shall be provided. This report shall consist of a series of technical memos, each written throughout the development of the GOES N-Q series.

### 5. DATA REQUIREMENTS

The contractor shall provide a GOES N-Q T & C Subsystem Performance Analysis report that describes and presents in detail the predicted performance of the spacecraft T &C Subsystem. The report shall contain, as a minimum, narrative, model data and analysis, where appropriate, addressing the following subjects as they pertain to the On-orbit and orbit raising T & C Subsystem functions.

#### Command Baseband Sections

Provide a block diagram of the data routing paths within the command function architecture, including the internal reports, status, and control, and their routing to the telemetry function.

Describe the process that converts a command data bit stream into command directives and then converts into desired actions, and reports their execution.

Describe the specific layers of the command function architecture including their operational protocols and data structuring techniques. Describe the process by which a command or set of commands is released for execution. Describe the requirements for the control of their delivery such as time windows, interrelationship and interdependency information, contingency procedures, etc. Describe the flow of internal status reports concerning the delivery of commands.

Describe the command function response and recovery from bus undervoltage, link dropouts, and protection mechanisms for invalid commands during anomalous or emergency conditions.

Describe the command data buffer and the internal checks for system resource constraints and allocations.

Describe the facility for the user to suspend, resume or abort the transfer of a single command and a set of commands at any time prior to their execution.



| DATA I   | TEM DESCRIPTION                                     | 2. NUMBER | SDA-3.2.9-01 |
|----------|---|-----------|--------------|
| 1. TITLE | Telemetry & Command Performance<br>Analysis (Cont.) | 3. DATE   | 8/26/97      |

### 5. DATA REQUIREMENTS - Cont.

Describe the command authentication protocol used during the secure command mode.

Describe the protocol for changing encryption keys. Provide a block diagram.

**Telemetry Baseband Sections** 

Provide a block diagram of the data routing paths within the telemetry function architecture, including the internal reports, status, and control, and their routing to the RF sections.

Describe the process that converts spacecraft telemetry data points into a digital data stream for RF modulation.

Describe all data format structuring, telemetry point sampling, and commendable operational modes. Show all relevant signal paths with a block diagram.

Radio Frequency Sections and Coverage:

- a. Center frequency, signal path gain distribution, dynamic range, RF bandwidth, G/T, channel isolation, overload protection, AGC performance, phase linearity, gain flatness, carrier phase noise, AM/AM and AM/PM conversion, spurious PM, incidental AM, EIRP, axial ratio, C/N, spurious outputs, frequency stability, noise figure, time delay, active and passive intermodulation and BER.
- b. The following technical performance parameters of the GOES N-Q, T & C subsystem RF telemetry and command function hardware, including gain, loss, bandwidth, noise temperature, amplifier power, and EIRP shall be presented in tabular form. The gain/loss tabulation shall include as a minimum each connector, waveguide section, flange VSWR, diplexer loss, switch loss, SIT pads, amplifier gain and power, amplifier backoff, transmit and receive antenna gains, EIRP, pre-amp gain, VSWR effects and pre-amp and transponder noise temperature calculation. The document shall provide separately the tolerance of each channel or service parameter, and BOL/EOL margins shall be shown. The tabulated data shall also be delivered in Excel spreadsheet compatible files with the applicable formulas.
- c. Operating modes and configurations.
- d. Analyze the frequency and channelization plan and provide analyses determining self-interference, mutual interference, cross channel interference, filter and isolation requirements with the on-orbit and transfer orbit antennas field of view predictions.





| DATA IT  | TEM DESCRIPTION                                     | 2. NUMBER | SDA-3.2.9-01 |
|----------|---|-----------|--------------|
| 1. TITLE | Telemetry & Command Performance<br>Analysis (Cont.) | 3. DATE   | 8/26/97      |

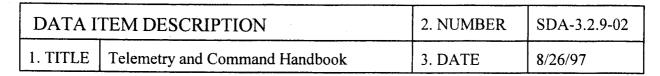
# 5. DATA REQUIREMENTS - Cont.

- e. Bus power consumption and inrush current.
- f. Transfer orbit and On-orbit coverage, antenna component measurement data, and link margin predictions.
- g. Spacecraft position and attitude prediction data of orbit raising activity.

# T & C Automated Test Equipment Testing

The contractor shall describe and present in detail the performance of each T & C Subsystem verification and compatibility test method and the hardware and software implementation. The report shall contain, as a minimum, narrative, software verification test data and analysis, addressing each verification test.

- a. Analysis efforts shall include showing that each signal path used for each measurement has proper bandwidth, power levels, and signal-to-noise ratios at each sensors most accurate range of measurement. The calibration error budget shall be determined and a measurement accuracy analysis completed.
- b. The contractor shall provide GOES N Spacecraft T & C Subsystem ATE equipment hardware drawings that describe and present in detail the component interconnections, signal routing paths, and command, control, and data acquisition interfaces. These drawings shall document both the electrical and mechanical configurations and include the complete signal pathways to the spacecraft T & C subsystem.



The contractor shall provide detailed and comprehensive description of all telemetered data and command structures available on the spacecraft.

### 5. DATA REQUIREMENTS

### **Telemetry List**

All telemetry shall be defined using contractor defined-character mnemonics. These mnemonics shall be grouped by spacecraft subsystem and payload component. The telemetry list shall include the location of each mnemonic in the telemetry stream, an English text description of what the mnemonic represent, and allowable values for the mnemonic.

### Command List

All commands shall be defined using contractor defined-character mnemonics. These mnemonics shall be grouped according to subsystem or payload component. The command list shall include the bit pattern sent for each mnemonic, an English text description of the function performed by the command, a listing of all passed parameters and the main telemetry affected by the command.

#### Telemetry/Command Cross Reference

List of commands that may affect each telemetry point List of telemetry affected by each command

#### **Telemetry Matrix Map**

Charts showing the entire telemetry matrix and the current content of each telemetry location

### Telemetry Processing Description

Detailed description of how each word of telemetry is decommutated and ground processed.

#### **Command Processing Description**

Detailed description of how each command is built by the ground system and processed by the spacecraft.

#### **T&C** Handbook Publication

The Telemetry and Command Handbook shall be issued separately for each successive S/C in the series. Each issue of the handbook shall be delivered electronically and via hard copy.







| DATAI    | TEM DESCRIPTION                       | 2. NUMBER | SDA-3.2.9-02 |
|----------|---------------------------------------|-----------|--------------|
| 1. TITLE | Telemetry and Command Handbook (Cont) | 3. DATE   | 8/26/97      |

# 6. SPECIAL PREPARATION INSTRUCTIONS

The T&C documentation shall include all GFE instrument commands and telemetry by incorporating documentation from the GFE instrument contractors.

| DATA I   | TEM DESCRIPTION   | 2. NUMBER | SDA-3.2.9-03 |
|----------|---|-----------|--------------|
| 1. TITLE | Command Encryptor M & O Manual and Interface Description Document | 3. DATE   | 8/26/97      |

- a. Enable the Government to review command encryption operation and maintenance and to familiarize students attending command link encryption training for maintenance and operation.
- b. Enable the Government to implement the interfaces required for the Command Encryptor.

# 5. DATA REQUIREMENTS

- a. Command Encryptor M & O Manual A detailed operations and maintenance manual shall be provided for the Encryptor units. The M & O Manual shall be prepared in accordance with NESS Standard S24.801, "Preparation of Operations and Maintenance Manuals", revised 07/15/92.
- b. Command Encryptor Interface Description
   The contractor shall provide a detailed description of all command Encryptor interfaces with the NOAA ground system.

| DATA ITE | EM DESCRIPTION                         | 2. NUMBER | SDA-3.2.10-01 |
|----------|--|-----------|---------------|
| 1. TITLE | Mechanisms Performance Analysis Report | 3. DATE   | 8/26/97       |

This data shall be used by NASA to determine that the GOES NO/PQ Mechanisms Subsystem design satisfies all performance requirements.

### 5. DATA REQUIREMENTS

This document shall consist of all analyses, simulations, and test results when possible of all electromechanical and deployable mechanisms and shall include as a minimum:

- a. Analysis, block diagrams, and computer simulations of all mechanisms and control systems which verify the design will meet performance requirements.
- b. A mechanisms requirements compliance matrix which shows how each requirement will be demonstrated. Test reports shall document all subsystem and component testing results.
- c. Calculation and measurement of gain and phase margins. Stability analysis to sensitive parameters.
- d. Force and torque margin analysis and testing when possible for all mechanisms.
- e. List of predicted dynamic disturbances generated by all moving components.
- f. Description of jitter measurements and telemetry available of all orbit spacecraft dynamics. These measurements will be used for performance verification and diagnostic capabilities.
- g. Timing margin analysis for asynchronous circuitry used in control systems.
- h. Worst case and end of life performance analyses.
- i. Life test plans for components with bearings, flexible mounts, or flexible harnessing.

## 6. SPECIAL PREPARATION INSTRUCTIONS

All supporting analysis, simulations, and/or databases for this report shall be available for review at the contractor's facilities.





| DATA IT  | TEM DESCRIPTION                           | 2. NUMBER | SDA-3.2.12-01 |
|----------|---|-----------|---------------|
| 1. TITLE | Software Requirements Specification (SRS) | 3. DATE   | 8/26/97       |

The Software Requirements Specification (SRS) specifies in detail all the requirements for a particular Computer Software Configuration Item (CSCI), including functional and performance requirements, interface requirements, data requirements, quality assurance requirements, testing requirements, security and safety requirements. A traceability matrix shall be included in the SRS that traces each software requirement to a performance specification, system, subsystem, or other higher-level requirement from which it is derived as well as the method which will be used to verify the requirement.

### 5. DATA REQUIREMENTS

The Software Requirements Specification shall be prepared in accordance with the contents of NASA-STD-2100-91, NASA-DID-P200 or DOD-STD-2167A, DID's DI-MCCR-80025A and DI-MCCR-80026A.

# 6. SPECIAL PREPARATION INSTRUCTIONS



| DATA IT  | TEM DESCRIPTION                | 2. NUMBER | SDA-3.2.12-02 |
|----------|--------------------------------|-----------|---------------|
| 1. TITLE | Software Design Document (SDD) | 3. DATE   | 8/26/97       |

The Software Design Document (SDD) describes in detail the architecture, structure and organization of a particular Computer Software Configuration Item (CSCI), decomposing the top-level CSCI into Computer Software Components (CSC's) and Computer Software Units (CSU's), or other natural division of the software (e.g., objects, classes, packages, etc.), as appropriate. The Software Design Document also describes each unit of software in terms of its interfaces (inputs and outputs), data architectures, processing (e.g., logic, algorithms, etc.), and traces each design feature to its corresponding requirement(s) in the SRS (for which a traceability matrix shall be provided as part of the SDD).

### 5. DATA REQUIREMENTS

The Software Design Document (SDD) shall be prepared in accordance with the contents of NASA-STD-2100-91, DID's NASA-DID-P300 and NASA-DID-P400, or DOD-STD-2167A, DID's DI-MCCR-80012A and DI-MCCR-80027A.

#### 6. SPECIAL PREPARATION INSTRUCTIONS



| DATA IT  | EM DESCRIPTION           | 2. NUMBER | SDA-3.2.12-03 |
|----------|--------------------------|-----------|---------------|
| 1. TITLE | Software Test Plan (STP) | 3. DATE   | 8/26/97       |

The Software Test Plan (STP) defines the total strategy, methodology, and approach for the complete testing of a particular Computer Software Configuration Item, including informal tests conducted on the Computer Software Component (CSC), Computer Software Unit (CSU), or other applicable divisions of software (object, class, package, etc.), and formal (qualification, acceptance testing) on the fully integrated CSCI. The STP shall identify and describe the test environment for each phase of testing. Any requirement which shall require the full satellite for its verification shall be identified. The Software Test Plan shall contain a traceability matrix which traces all test cases, procedures, descriptions to their corresponding. SRS requirement.

### 5. DATA REQUIREMENTS

Since NASA-STD-2100-91 does not have a DID for the Software Test Plan, the contractor may use DOD-STD-2167A DID DI-MCCR-80014A as a guideline for this document, which shall, as a minimum, contain the following items: Introduction, Scope, Purpose, Organization, Objectives, Applicable Documents, Reference Documents, Informational Documents, Test Environments, Test Management, Test Control, Test Execution, Test Evaluation, Data Collection, Pass/Fail Criteria, Data Reduction Techniques, Results Analysis Techniques, Traceability of Each SRS Requirement to Informal and Formal Tests, Unit Testing, CSC Testing, CSC Integration Testing, CSCI Testing, Informal Test Plans, Formal Test Plans, Plan for Delivery of Software to Satellite Integration and Testing, Required Resources (Flight-like Hardware, Interface and Support Software, Test Equipment, etc.), Facilities, Personnel.

### 6. SPECIAL PREPARATION INSTRUCTIONS



| DATA IT  | TEM DESCRIPTION                 | 2. NUMBER | SDA-3.2.12-04 |
|----------|---------------------------------|-----------|---------------|
| 1. TITLE | Software Test Procedures (STPR) | 3. DATE   | 8/26/97       |

The Software Test Procedures (STPR) document contains the step-by-step procedures for implementing each software test in the Software Test Plan (STP), including the detailed procedures for data reduction and the analysis of test results. Computer-based automated test procedures implemented by the contractor to automate the software testing shall be included in the document or as an appendix. The Software Test Procedures document shall contain a traceability matrix which traces all test cases, procedures, and descriptions to their corresponding SRS requirement(s).

### 5. DATA REQUIREMENTS

The Software Test Procedures (STPR) document shall be prepared in accordance with the contents of NASA-STD-2100-91, DID's NASA-DID-A000, NASA-DID-A100, and NASA-DID-A200, or DOD-STD-2167A, DID DI-MCCR-80015A.

#### 6. SPECIAL PREPARATION INSTRUCTIONS



| DATA IT  | EM DESCRIPTION             | 2. NUMBER | SDA-3.2.12-05 |
|----------|----------------------------|-----------|---------------|
| 1. TITLE | Software Test Report (STR) | 3. DATE   | 8/26/97       |

The Software Test Report (STR) records the results of all formal qualification testing of a particular Computer Software Configuration Item (CSCI), including test history logs.

### 5. DATA REQUIREMENTS

The Software Test Report (STR) shall be prepared in accordance with the contents of NASA-STD-2100-91, DID NASA-DID-R009, or DOD-STD-2167A, DID DI-MCCR-80017A.

## 6. SPECIAL PREPARATION INSTRUCTIONS





| DATA ITEM DESCRIPTION |                                    | 2. NUMBER | SDA-3.2.12-06 |
|-----------------------|------------------------------------|-----------|---------------|
| 1. TITLE              | Version Description Document (VDD) | 3. DATE   | 8/26/97       |

Deleted per CCR 6098 MOD 43

| DATA I   | TEM DESCRIPTION                             | 2. NUMBER | SDA-3.2.12-07 |
|----------|---|-----------|---------------|
| 1. TITLE | Software User and Maintenance Manual (SUMM) | 3. DATE   | 8/26/97       |

The Software User and Maintenance Manual (SUMM) shall contain all the information required to use and maintain the software, including the detailed procedures for troubleshooting and "patching" (i.e., fixing/modifying/replacing portions of) the flight code.

### 5. DATA REQUIREMENTS

The Software User and Maintenance Manual (SUMM) shall be prepared in accordance with the contents of NASA-STD-2100-91, DID's NASA-DID-P600 and NASA-DID-P700, or DOD-STD-2167A, DID's DI-MCCR-80019A and DI-MCCR-80021A.

### 6. SPECIAL PREPARATION INSTRUCTIONS



| DATA I   | TEM DESCRIPTION               | 2. NUMBER | SDA-3.2.12-08 |
|----------|-------------------------------|-----------|---------------|
| 1. TITLE | Firmware Support Manual (FSM) | 3. DATE   | 8/26/97       |

Deleted per CCR 6098 MOD 43



| DATA I   | TEM DESCRIPTION                                      | 2. NUMBER | SDA-3.2.12-09 |
|----------|--|-----------|---------------|
| 1. TITLE | Attitude Control Subsystem (ACS) Algorithms Document | 3. DATE   | 8/26/97       |

To fully describe all the Attitude Control Subsystem (ACS) algorithms which will be implemented in flight software. This document provides intermediary information which the ACS personnel will use to communicate and capture the software implementation.

## 5. DATA REQUIREMENTS

The Attitude Control Subsystem (ACS) Algorithms Description Document shall describe the ACS algorithms with sufficient detail to be useful to software engineers, design engineers, subsystem and systems engineers. It shall include textual descriptions of each algorithm and diagrams such as mode-transition diagrams data flow diagrams, structure charts, control diagrams, etc. It will describe each algorithm in terms of inputs, outputs, and processing. It will define software interfaces and internal variables, execution rates, deadlines, operational constraints and restrictions.



| DATA I   | TEM DESCRIPTION  | 2. NUMBER | SDA-3.2.12-10 |
|----------|--|-----------|---------------|
| 1. TITLE | Electrical Power and Distribution Subsystem (EPDS) Algorithms Document | 3. DATE   | 8/26/97       |

To fully describe all the Electrical Power and Distribution Subsystem (EPDS) algorithms which will be implemented in the flight software. This document provides intermediary information which the EPDS analysts and software engineers will use to write the EPDS software implementation.

#### 5. DATA REQUIREMENTS

The Electrical Power and Distribution Subsystem (EPDS) Algorithms Description Document shall fully describe the EPDS algorithms with sufficient detail to be useful to software engineers, design engineers subsystem, and systems engineers. This document shall include textual descriptions of each algorithm and diagrams such as: mode-transition diagrams, data flow diagrams, structure charts, control diagrams, etc. It will define software interfaces and internal variables, execution rates, deadlines, operational constraints and restrictions.



| DATA I   | TEM DESCRIPTION                           | 2. NUMBER | SDA-3.2.12-11 |
|----------|---|-----------|---------------|
| 1. TITLE | Flight Computer Design Description (FCDD) | 3. DATE   | 8/26/97       |

To fully describe the computing environment in which the flight software will operate.

### 5. DATA REQUIREMENTS

The Flight Computer Design Description (FCDD) shall provide a detailed design description of the flight computer(s) hardware and shall include descriptions of the following items:

- a) Microprocessor(s) and associated support chip set(s) (e.g., programmable interrupt controllers, programmable interval timers, caches, memory management units, timers, crystal oscillators, direct memory access controllers, etc.) used in the flight computer.
- b) Flight computer instruction set architecture.
- c) Flight computer power requirements, including brownout and blackout levels.
- d) Memory components (RAM, ROM, EEPROM, PLA's, cache), architecture, and sizing. Use of memory features like segmentation, paging, etc.
- e) Flight computer data and instruction bus architecture and timing, including special features of the computer bus (redundancy, direct memory access (DMA), multiple processor cache protocols, etc.). The systems clock and how timing signals are generated for the microprocessor(s) shall also be addressed.
- f) Relationship to mass storage media (on-board recorder interfaces, etc.).
- g) Use of Field Programmable Gate Arrays (FPGA's), Digital Signal Processors (DSP's), and Application Specific Integrated Circuits (ASIC's) in the flight computer(s), and a complete description of their design and operation.
- h) Radiation and fault tolerance characteristics of the flight computer(s).
- i) Initialization, powering, switching, restarting, rebooting, and shutdown sequences for the flight computer(s).
- j) All interrupts, their priorities, and characteristics (maskable, non-maskable).
- k) Interrupt service routines required as low-level interface drivers.
- 1) Boot ROM, boot code, microprocessor test modes, built-in test modes, etc.



| DATA     | ITEM DESCRIPTION   | 2. NUMBER | SDA-3.2.12-12 |
|----------|--|-----------|---------------|
| 1. TITLE | Software Management, Development, and Assurance Plan (SMDAP) | 3. DATE   | 8/26/97       |

To define the offeror's systematic approach to, and processes used in, the management, development, testing (verification, validation, qualification), documentation, configuration management, and quality assurance of the GOES N/Q Flight, and associated Electrical Ground Support Equipment Software.

### 5. DATA REQUIREMENTS

The Software Management, Development, and Assurance Plan (SMDAP) shall be prepared in accordance with the full, untailored contents of NASA-STD-2100-91, NASA-DID-M000 (including all subsumed DID contents from M000 to M700, or DOD-STD-2167A and DOD-STD-2168 standards (in which case the contractor shall use, as a minimum, the contents of DID's DI-MCCR-80030A and DI-QCIC-80572).

#### 6. SPECIAL PREPARATION INSTRUCTIONS

The contractor may tailor this document as appropriate or use alternate guidelines (e.g., MIL-STD-498, IEEE Standards) for its preparation.



| DATA I   | TEM DESCRIPTION                     | 2. NUMBER | SDA-3.2.13-01 |
|----------|-------------------------------------|-----------|---------------|
| 1. TITLE | Spacecraft Emulator Design Document | 3. DATE   | 8/26/97       |

To Provide documentation which can be used to understand the design and operation of the Spacecraft Emulator.

### 5. DATA REQUIREMENTS

The Spacecraft Emulator Design Document shall describe the detailed design of the spacecraft emulator, including all hardware, software, firmware, and commercial-off-the-shelf (COTS) test equipment used in the emulator. Distinctions shall be made between flight-like components, simulated components, and full-software simulations.







| DATA ITEM DESCRIPTION |  | 2. NUMBER | SDA-3.2.13-02 |
|-----------------------|--|-----------|---------------|
| 1. TITLE              | Spacecraft Emulator User's Operations and Maintenance Manual | 3. DATE   | 8/26/97       |

The contractor shall supply a complete reference on all aspects of the spacecraft emulator to assure NASA and NOAA ability to setup, use, troubleshoot, repair and modify the spacecraft emulator.

### 5. DATA REQUIREMENTS

The data required to perform this activity divided into three main categories; user data, operator data and maintenance data.

### **USER DATA**

Description of Capabilities - describes features, capacities, and limitations of the emulator and its displays

Normal configuration and use - step by step menu of exact steps needed to bootstrap the emulator, including error avoidance and recovery.

Saving Simulation Status - method by which user can suspend the simulation for future use. Fast Forwarding - describe how to run simulator in other than real time. Discusses constraint on non-realtime simulations.

Test Modes - delineates all possible operational modes of the emulator.

Graphics interfaces - complete description of operation of all graphics available to the simulator

#### **OPERATOR DATA**

Emulator Component Interfaces - describes each and every component within the emulator and shows how it interfaces to the ground system.

Modes of Operation - detailed description of all mode of operation of the emulator and the appropriate display pages.

Anomaly Modeling - describes the types of anomalies that can be simulated and the means of producing them.

#### **MAINTENANCE DATA**

Requirements Specification - the complete specifications provided to the designers of the emulator.



Detailed Design Document - all documentation on the final design including system architecture, platform selection criteria, module connectivities, error-handling capabilities, system expansion methodology, and user interfaces.

| DATA ITE | EM DESCRIPTION  | 2. NUMBER | SDA-3.2.13-02 |
|----------|---|-----------|---------------|
| 1. TITLE | Spacecraft Emulator User's Operations and Maintenance Manual (Cont) | 3. DATE   | 8/26/97       |

### 5. DATA REQUIREMENTS - Cont.

Hardware Design and Specification - all documentation used in the selection, fabrication, installation, and integration of the hardware components of the emulator.

Acceptance Test Plan, Procedures, and Reports - all documentation regarding acceptance of the emulator including results of all test performed, all procedures run against the emulator and the final report accepting the emulator.

Version Description Document - precise report for each new build of the emulator describes each change to the emulator hardware or software, including reason for change request, date requested and date released.

#### **TRAINING**

- 1. The spacecraft contractor shall provide training and training materials in conjunction with modified and new ground system elements associated with SOW (S-415-22) paragraph 3.3.13 as follows:
  - a. HSE User/Operator Training.
- 2. Training documentation shall be part of in CDRL SDA-3.2.13-02 and shall include:
  - a. HSE Training Plan
    - i. Introduction
    - ii. Statement of Purpose and Scope
    - iii. Applicable Documents
    - iv. Training Resources
    - v. Training Course Structure
  - b. HSE User/Operator Training and Users Manuals
    - i. Introduction
    - ii. Training Course Structure
    - iii. Training Schedule
    - iv. System and Operations Overview
      - a. Bringing up the S/C emulator
      - b. Bringing up the SXI simulator
      - c. Connecting the emulator to GTACS using NTACTS or CORTEX emulation
      - d. Connecting the Imager/Sounder simulator component to SPS
      - e. Connecting the emulator to MRS&S
      - f. Configuring the emulator, Imager/Sounder simulator, and SXI simulator for specific simulation scenarios (lecture and lab)
      - g. Changing variables for the emulator, Imager/Sounder simulator, and SXI simulator for the purpose of validating different procedure paths (lecture and lab)

CCR 4226C MOD 49





| DAT      | A ITEM DESCRIPTION  | 2. NUMBER | SDA-3.2.13-02 |
|----------|---|-----------|---------------|
| 1. TITLE | Spacecraft Emulator User's Operations and Maintenance Manual (Cont) | 3. DATE   | 8/26/97       |

- h. Changing variables and turning ON/OFF modeling in the emulator
- i. Monitoring simulation variables at the emulator (lecture and lab)Equipment Layout and Interconnection
- j. Verifying interconnections for all emulator and GFE simulator external interfaces
- k. Troubleshooting interconnection problems for all emulator and GFE simulator external interface.
- c. Users documents to support all deliverable SDVE tools. COTS users documents are sufficient where applicable.
- 3. The spacecraft contractor shall conduct emulator training for approximately 10 government emulator support personnel.
- 4. Training classes and materials shall be developed in accordance with the General Requirements for Training on Electronic Equipment, NOAA/NESDIS Standard S24.804.
- 5. Training shall be completed no later than two weeks after completion of SSGS Post-Ship Testing.



This item can be delivered in multiple volumes and must be delivered in electronic format. The user data and operator data shall feature pull down help menus. The maintenance data shall be password protected.





| DA       | TA ITEM DESCRIPTION               | 2. NUMBER | SDA-3.2.14-01 |
|----------|-----------------------------------|-----------|---------------|
| 1. TITLE | SEM Data and Calibration Handbook | 3. DATE   | 8/26/97       |

To compile in one document all information and data necessary for functional understanding, orbital operations and data processing, and archived ground calibrations for the Space Environment Monitor (SEM) subsystem.

### 5. DATA REQUIREMENTS

The SEM Data and Calibration Handbook shall contain a generic section, with a spacecraft specific addendum for each individual spacecraft. The generic section shall contain:

- a. A functional description of each instrument, including block diagrams, schematics, and logic diagrams necessary for thorough understanding. The format for all raw data channels available from each instrument, and all spacecraft data channels needed for instrument calibration and data reduction shall be described in detail.
- b. The analytical form of data processing algorithms for each instrument, showing all use of ground and on-orbit calibration data required to convert raw data channels to data in engineering units meeting specified performance requirements. These algorithms shall include, but not be limited to, temperature corrections required, corrections necessary to remove contamination of any data channels by ambient particle radiation, and magnetic field corrections required for the magnetic signature of any spacecraft components whose stray magnetic signature exceeds allowable limits, i.e. magnetic torquer coils.
- c. A tabulation of estimated dipole moment, position and orientation and calculated field at the magnetometer sensor, for all spacecraft components known to possess significant magnetic material. This tabulation is derived from the spacecraft magnetic field model.
- d. The physical location of the SEM instruments and each sensor orientation with respect to the spacecraft axis.

Each spacecraft specific addendum shall contain:

- a. Specific sets of numerical calibration data pertinent to that set of instruments including the characterization of all relevant directional and spectral responses.
- b. A description of changes in the as-built configuration from previous instruments and/or spacecraft which affect the performance of any SEM instrument.
- c. Baseline spacecraft level performance test reports for each SEM instrument.



| DATA ITEM DESCRIPTION |   | 2. NUMBER | SDA-3.2.14-02 |
|-----------------------|---|-----------|---------------|
| 1. TITLE              | Spacecraft Magnetic Control Plan for Magnetometer Performance Assurance | 3. DATE   | 8/26/97       |

To ensure that no spacecraft (or spacecraft appendage) steady or time-varying field interferes with the NOAA SEM magnetometer instrument meeting all required specification levels, as defined in the magnetometer performance specification, to measure the Earth's ambient magnetic field.

### 5. DATA REQUIREMENTS

The GOES-N Spacecraft Magnetic Control Plan for Magnetometer Performance Assurance, shall provide for the following activities:

- a. Identification and characterization of all magnetic materials used in fabrication of spacecraft flight hardware with the objective of minimizing the use of permanent and soft magnetic materials. Special attention shall be given to any parts which move in the spacecraft frame of reference.
- b. Design procedures and design review requirements which will ensure that stray magnetic fields arising from current loops in the spacecraft subsystems, payloads, and the associated interconnection harnessing are minimized. Special attention is required for all elements of power generation and distribution, heaters, communications components, and subsystems whose status changes frequently. A system level stray magnetic test to be performed by the spacecraft contractor at the spacecraft contractor's facility shall demonstrate that each individual spacecraft module and the flight system as a whole meet the intent of the stray field magnetic specification. A correction scheme (algorithm) must be delivered to the NOAA Space Environment Center that can be used in real-time data processing to correct for any magnetic signature that exceeds magnetometer specification limits.
- c. A magnetic test program to ensure that all flight equipment used in the vicinity of the magnetic sensors meets stringent limitations on hard and soft permanent magnetic fields. The program shall include magnetic screening of all parts and materials used on the magnetometer boom. Guidelines shall be issued on materials and tools used in the vicinity of the magnetometer sensors. It shall provide for a suitable zero field test facility for measurement, at both bench and system level test, of sensor zero offset at the spacecraft contractor's facility. The sensor zero offset should be measured multiple times throughout the program.
- d. A spacecraft magnetic field model which shall include dipole moment, position and orientation for all spacecraft subsystems known to possess significant magnetic material. The model will be used to predict the worst case magnetic signature from the spacecraft body at the flight sensor assembly as well as to estimate the worst case spacecraft attitude perturbations caused by magnetic torque.





| DA       | TA ITEM DESCRIPTION   | 2. NUMBER | SDA-3.2.14-02 |
|----------|---|-----------|---------------|
| 1. TITLE | Spacecraft Magnetic Control Plan for<br>Magnetometer Performance Assurance (Cont) | 3. DATE   | 8/26/97       |

# 5. DATA REQUIREMENTS - Cont.

- e. Measurements at the spacecraft contractor's facility of the residual dipole moment of the GOES N and GOES O spacecraft. At the spacecraft contractor's discretion, the government will provide instrumentation, personnel, and data analysis to make this measurement and publish the test report, given a contractor supplied, non-magnetic (<200 gauss cm³) turntable capable of rotating the spacecraft about one principal axis in controlled 10 degrees increments. (CCR6339B, Mod102)
- f. Measurements (by the Payload Test Team) during early phases of on-orbit operations of the residual spacecraft field along each flight magnetometer axis. This can be done by recording the magnetometer measurements while rotating the spacecraft sequentially about each of three principal axes.

| DA       | ATA ITEM DESCRIPTION           | 2. NUMBER | SDA-3.2.14-03 |
|----------|--------------------------------|-----------|---------------|
| 1. TITLE | SXI Pointing & Jitter Analysis | 3. DATE   | 8/26/97       |

To demonstrate that the SXI pointing and jitter requirements will be met by the proposed spacecraft design.

## 5. DATA REQUIREMENTS

The SXI pointing analysis shall include the effects of:

1. All the alignment errors contributing to the SXI pointing errors.

2. Spacecraft attitude error budgets. In particular, quantify the effects of attitude errors on SXI pointing;

3. Orbital eccentricity on pointing errors. Investigate the effects of eccentricity over the minimum as well as the maximum values within the allowable range.

The analysis shall investigate the combined effects of the above three specific categories and any additional ones that adversely affect the SXI pointing. The analysis shall also demonstrate how the SXI pointing requirements will be met by the spacecraft design.

The SXI jitter analysis shall consist of an articulated flexible multi body dynamic model that captures the articulating nature of the solar array in addition to the vibrational dynamics. Analyses that consider the array at different but fixed orientations with respect to the bus will not suffice. It is the transition between the different orientations that determines the spacecraft and SXI jitter. The SXI jitter environment shall be characterized over a full solar array rotation. An ad hoc, public domain (e.g., TREETOPS, DISCOS), or commercial (e.g., ADAMS, DADS) articulated flexible multi body analysis tool must be used to demonstrate that this requirement is met. If an ad hoc Simulation Software is used, the spacecraft contractor shall provide the mathematical modeling details. If a public domain or commercial modeling tool is used, the spacecraft contractor shall provide the input data file.

In addition to the excitation of the vibrational motion of the solar array due to the array articulation, other sources of excitation must be considered. All sources of disturbances shall be catalogued. These disturbances shall include but not be limited to those arising due to the operations of the Imager and the Sounder, especially the black body calibrations (BBCALs) of the Imager and the sounder.



| DA       | ATA ITEM DESCRIPTION                         | 2. NUMBER | SDA-3.2.16-01 |
|----------|--|-----------|---------------|
| 1. TITLE | INR System Description and Analysis Document | 3. DATE   | 8/26/97       |

Evaluation of proposed INR concept and implementation. Describe and update, as required, to reflect the most current record of the expected INR performance and operation, based on analyses and test results.

# 5. DATA REQUIREMENTS

- 1. Provide a detailed system description of the INR concept and its implementation, to include the GFE instrument performances and the expected overall performance.
- 2. Provide separate Navigation and Registration INR error performance allocation budgets for normal, post-eclipse, and station keeping periods, and any other unique periods where the performance will be or may be different from the expected normal operational period performance. For all but the normal operational period, the instruments may be excluded. The allocation budgets shall include the effects of sun declinations of ±8.7, ±23 and zero degrees (equinox). The INR error allocation budgets shall contain all known contributions to INR mispointing; the roll, pitch and yaw errors shall be shown as well as the resulting East-West and North-South pointing errors. In addition, the rationale describing the methodology chosen to combine the individual error allocations into successive allocation levels up to the overall performance requirement of the specification shall be provided. As a minimum, the following entries shall be included, with static and dynamic errors identified; the frequency ranges of the errors also shall be provided.
  - a. Spacecraft control system jitter,
  - b. Uncompensated dynamic interactions and their frequencies,
  - c. Instrument induced attitude disturbances (e.g., caused by black body calibrations),
  - d. Errors in the estimation of the various compensation signals (e.g., curve fit error for rapidly changing thermal induced errors),
  - e. Instrument pointing errors associated with the servo performance (provided in specification S-415-22, and the Imager and Sounder ICD's, and to be updated periodically throughout the effort). Data from the "GFE Instrument (BOL) Measured/Analytical EW/NS" column (Tables 4.1.7-1 and 4.1.7-2) in the specification are to be used.
  - f. Thermally induced non-repeatable errors (spacecraft & instruments),
  - g. Orbit determination errors,
  - h. Attitude determination errors,
  - i. Estimates of non-repeatable errors (magnitude & characteristics),
  - j. ACS maneuver timing and impacts to instruments during data collection.
- 3. For each INR budget item, the initial planned approach for determining and compensating the error (i.e., using the control system, repointing the mirror, mix of the control system and mirror, etc.) shall be provided by the contractor with his proposal and updated as required. Of particular interest are the frequencies associated with each error and the

| DATA ITEM DESCRIPTION |   | 2. NUMBER | SDA-3.2.16-01 |
|-----------------------|---|-----------|---------------|
| 1. TITLE              | INR System Description and Analysis Document (Cont) | 3. DATE   | 8/26/97       |

### 5. DATA REQUIREMENTS - Cont.

approaches for compensating any rapidly changing errors, and ensuring that rapidly changing errors do not exceed the allocation for the servo input signal (provided in the instrument ICD's).

- 4. A worst case Navigation and Registration INR error performance allocation budget for a normal period with the sun at a +8.7 degree declination using the Imager instrument data from the "GFE Instrument (BOL) Specification EW/NS" column in the specification S-415-22, Table 4.1.7-1 shall be provided and updated as required.
- 5. The initial estimates for the effects of instrument pointing variations at sun declinations of  $\pm 10$ ,  $\pm 23$  and zero degrees (equinox) shall use the maximum rate of change (slope) of the instrument pointing and the peak-peak variation provided in the specification S-415-22, and the instrument ICD's.
- 6. Provide descriptions of all INR interfaces (e.g., instrument, telemetry and command, OGE, etc.), including interface boxes, if required, to maintain or minimize changes to existing interfaces, operational procedures and/or communication formats.
- 7. Provide a detailed description of the operational concept, including types, duration and frequency of command uploads, operational manpower estimates, etc.





| DA       | ATA ITEM DESCRIPTION                  | 2. NUMBER | SDA-3.2.16-02 |
|----------|---------------------------------------|-----------|---------------|
| 1. TITLE | INR Related System Performance Report | 3. DATE   | 8/26/97       |

This report shall evaluate the mechanical, thermal, structural, and electrical design adequacy and suitability for INR, based on up-to-date analyses and test results.

### 5. DATA REQUIREMENTS

- 1. A description of the spacecraft mechanical, structural and thermal interface designs that are provided for the Imager and Sounder and the engineering rationale explaining how the designs minimize the thermally induced, diurnal pointing variations and the probability of thermal snap.
- 2. An analysis of the total mechanical, electromechanical, ACS, structural dynamics and thermal design using the instrument models provided and/or test data demonstrating that the INR compensation dynamic range will not be exceeded (i.e., that there is sufficient margin after accounting for thermal deformations for the remaining IMC compensations in the Fixed grid mode).
- 3. Analysis and/or test data showing that the dynamic interactions generated on the spacecraft are within the specified magnitudes at the specified frequencies; the analysis shall include all instruments (Imager, Sounder, SXI and SEM) and their supporting subsystems; this analysis shall include a summary of the predicted disturbance environment (amplitude and frequency) at each instrument interface during all instrument operations. When available, test results of the measured dynamic interaction between the S/C and instruments, and between instruments shall be included. Calibration reports of the sensors used to measure on-orbit jitter shall also be included.
- 4. Analyses and/or test data showing that the dynamic interactions generated by the instruments will not affect any spacecraft operation, and have been accounted for in the INR Performance Budget (part of the INR System Description and Analysis Document, CDRL SDA-3.2.16-01)
- 5. An analysis and/or test data showing that the instrument critical temperatures at the interface points are within the specified ranges.
- 6. Estimates and/or test data for the expected worst case INR compensation signals (e.g., high rates of change and/or large magnitudes caused by thermal deformations prior to or immediately following eclipse periods) to demonstrate that the compensation signals do not exceed the allocation for the servo input signals (provided in the instrument ICDs).
- 7. Analyses and/or test data demonstrating that effects on electrical signal interfaces due to EMI/EMC, power transients, grounding methodologies, harnessing, etc. will not adversely affect any INR performance. One specific area of concern is the analog signals to/from the instruments.







| DA       | ATA ITEM DESCRIPTION                  | 2. NUMBER | SDA-3.2.16-02 |
|----------|---------------------------------------|-----------|---------------|
| 1. TITLE | INR Related System Performance (Cont) | 3. DATE   | 8/26/97       |



| DA       | TA ITEM DESCRIPTION        | 2. NUMBER | SDA-3.2.17-01 |  |
|----------|----------------------------|-----------|---------------|--|
| 1. TITLE | Contamination Control Plan | 3. DATE   | 8/26/97       |  |

To provide a contamination control plan that defines the necessary levels of cleanliness and defines the methods and procedures to be followed to achieve adequate cleanliness and contamination control for the spacecraft with respect to the instrument performance requirements.

To define the approach required to maintain cleanliness and contamination control during shipping, spacecraft integration and test, storage, shipping, launch site processing, launch, ascent, and through End Of Life.

### 5. DATA REQUIREMENTS

As a minimum, the contamination control plan shall include the following in relation to the S-415-22 Performance Specification.

- 1. Define the beginning of life and end-of-life (EOL) contamination control requirements for all surfaces that affect instrument or spacecraft performance. Provide a contamination budget delineating the performance degradation for particulate (ground based and on-orbit contributions) and molecular (ground based non-volatile residue and on-orbit outgassing) contaminants as a function of development phase of the spacecraft through EOL.
- 2. Determine the effect of on-orbit outgassing on the spacecraft and instrument thermal and optical performance. All sources that have a line of sight from direct or return flux shall be considered. This includes, but is not limited to, the following: Solar Array(s) interior and exterior materials, the spacecraft panel surfaces, all appendages, spacecraft MLI, and venting from the internal spacecraft, etc. The analyses shall be conducted using MOLEFLUX or equivalent to determine depositions on sensitive surfaces. Provide a particulate analysis that predicts redistribution during launch, ascent and on-orbit mission phases. The analysis shall include launch vehicles (LV) contribution to the S/C. All analyses will include: theory assumptions, results of all runs/cases, geometric models, view factors, sticking coefficients, temperature defined outgassing rates, and accumulations.
- 3. Identify all spacecraft flight hardware items to be vacuum baked and certified in order to achieve the overall instrument/spacecraft performance requirements, as a function of the impact from the spacecraft. Provide the bakeout parameters for temperature, pressure, and quartz crystal microbalance rates.
- 4. Define the contamination mitigative aspects of the design (e.g. material selection, vent design and orientation, baffles, decontamination heaters, etc.). Include the verification methodology necessary for achieving the contamination budgets. Describe the techniques for verifying surface cleanliness levels and materials outgassing rates.
- 5. Ascertain that all materials used in the design conform to the meet minimum outgassing screening criteria provided by NASA Reference Publication 1124, entitled, "Outgassing



| DA       | TA ITEM DESCRIPTION               | 2. NUMBER | SDA-3.2.17-01 |
|----------|-----------------------------------|-----------|---------------|
| 1. TITLE | Contamination Control Plan (Cont) | 3. DATE   | 8/26/97       |

Data for Selecting Spacecraft Materials". This publication is intended to be used as guidelines for initially screening materials, and it is not intended to be used as pass/fail criteria. Materials used in close proximity to critical optics or sensitive thermal control surfaces may require more stringent requirements and limitations on material quantities. The more stringent requirements will be established according to instrument performance requirements and modeled as noted in 2, above.

- 6. Define the requirements and the methods and procedures required to maintain cleanliness during spacecraft integration and test and launch site processing. The requirements shall be based upon the most sensitive affected system, any GSE or LV hardware which comes in contact with the spacecraft shall meet the requirements of that flight hardware, including instruments.
- 7. Identify the environmental facility parameters necessary for fabrication, assembly, I & T, and launch operations of the spacecraft. As a minimum, the parameters shall include airborne particulate room classification, relative humidity, temperature, fallout rates, non-volatile residue (NVR) accumulation, hydrocarbon levels, and garment requirements
- 8. Provide all cleaning, inspection, and bagging plans/procedures necessary for ground support equipment, interface hardware, and flight hardware for all assemblies during all phases.
- 9. Provide an assessment for maintaining cleanliness during transportation and storage periods of the spacecraft.
- 10. Provide an operation flow chart that identifies when all planned cleanliness inspections, spacecraft bagging, and cleanings will occur from manufacture through launch site processing.
- 11. Describe the methods by which cleanliness requirements are flowed down to the subcontractors, and how the subcontractor hardware will be inspected/tested to ensure compliance to all cleanliness requirements.
- 12. Provide a spacecraft specific contamination control training program for all personnel required to work on flight hardware in cleanrooms, clean areas, or on clean benches.
- 13. Include a monitoring plan for the spacecraft and integrated exposed instrument surface cleanliness and outgassing requirements for fabrication, assembly, integration & test, spacecraft ground processing and launch site activities (including fairing encapsulation). For on-orbit EOL, provide analyses that demonstrate performance/ cleanliness requirements are met. The spacecraft contractor shall support periodic reporting of contamination levels during all points in the flow.





| D        | ATA ITEM DESCRIPTION              | 2. NUMBER | SDA-3.2.17-01 |
|----------|-----------------------------------|-----------|---------------|
| 1. TITLE | Contamination Control Plan (cont) | 3. DATE   | 8/26/97       |



- 14. Define contingency on-orbit cleaning capability for optical and thermal control surfaces in order to maintain performance requirements.
- 15. The purge gas for all spacecraft operations shall be high-purity gaseous nitrogen (GN<sub>2</sub>) conforming to the MIL-STD-27401 Grade B, Type I requirements for total hydrocarbons (THC) and moisture. In lieu of GN<sub>2</sub>, manufactured air may be used if oxygen does not degrade the system. All purity requirements are as follows: <5 ppm THC, <11.5 ppm moisture, -75 F degrees dew point, 99.99% Nitrogen, and Class 500 (per FED-STD-209) for particulate. A 0.5μm particulate filter is required for in-line use with the purge system located at the entrance to the instrument. Verification of these requirements is required for all purge sources as sampled from point of use. Documentation of the cleanliness/purity shall be provided to the contamination engineer prior to purge connection/use. A purge gas methodology shall be provided for the entire spacecraft flow from instrument integration through launch operations.
- 16. Provide a plume analyses from station-keeping maneuvers or orbit transfers. The analysis shall assess any potential degradation to the spacecraft and instrument thermal and optical performance requirements. Consider LV retrorockets and thruster exhaust plume impact on the spacecraft.
- 17. Define any launch or on-orbit constraints necessary to satisfy instrument and spacecraft contamination requirements.
- 18. Provide document updates at PDR to S-415-28 and S-415-29 that reflects changes from the current GOES I-J spacecraft design. For the proposal, provide an approach to the purge system and fairing cleanliness impact to the spacecraft and instrument requirements. The approach shall include all purge logistics at the launch site and fairing surface cleanliness, verification, and monitoring relative to spacecraft design differences.



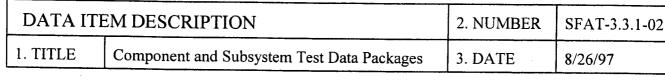
| DATA I   | TEM DESCRIPTION                         | 2. NUMBER | SFAT-3.3.1-01 |
|----------|---|-----------|---------------|
| 1. TITLE | Component and Subsystem Test Procedures | 3. DATE   | 8/26/97       |

These documents will be used to review the qualification and acceptance test activity at the subsystem and component levels of assembly.

# 5. DATA REQUIREMENTS

The Verification Test Procedures shall describe the implementation of the verification test plan requirements, and shall also describe the accept/reject criteria for the planned measurements.





To document and review the results of each test activity.

### 5. DATA REQUIREMENTS

The contractor shall evaluate the data taken during command and subsystem testing for conformance with the applicable specification and programmatic requirements.

As a minimum, the data package shall contain:

- a. Test data
- b. Evidence of Quality Assurance acceptance data
- c. Listing of test requirements verified
- d. Summary description and commentary on the test data package
- e. Test procedures as run
- f. Test procedure change record listing
- g. Data trending
- h. Analysis used to demonstrate compliance with component PVP/PVM requirements
- i. Configuration identification list
- j. Material review actions resulting from the tests
- k. Test equipment calibration data
- 1. Failure report listing and copies as required, (including status/resolution if completed by submittal)
- m. Operating time/cycle data
- n. (deleted)

CCR 4226C MOD 49

### 6. SPECIAL PREPARATION INSTRUCTIONS

Data packages shall be collected and delivered to GOES Resident Office and the GSFC Contract Office for review and archival



| DATA ITEN | M DESCRIPTION              | 2. NUMBER | I&T-3.4.4-01 |
|-----------|----------------------------|-----------|--------------|
| 1. TITLE  | Spacecraft Test Procedures | 3. DATE   | 8/26/97      |

To provide information on how the spacecraft will be tested and how its performance will be verified during Integration and Test.

### 5. DATA REQUIREMENTS

These procedures shall be prepared for each test activity defined in the Performance Verification Plan and shall cover all spacecraft test operations, interfaces, and spacecraft performance requirements (i.e., electrical, structural and mechanical, EMC), and shall cover specialized tests such as mechanical function and deployments, environmental exposure tests (i.e., vacuum, vibration), spacecraft calibration, GSE calibration and checkout, and pre-launch end-to-end tests. As a minimum, the procedures shall contain such information as:

- a. Test Objectives
- b. Test Methods
- c. Applicable Documents and Software
- d. Required Spacecraft Configuration
- e. Test Equipment Configuration
- f. Test Equipment Identification
- g. Test Instrumentation
- h. Safety Provisions and Cautions
- i. Program Quality Requirements
- i. Test Instructions
- k. Data Recording Requirements
- l. Data Recording Forms and Tables
- m. Accept/Reject Criteria
- n. Test Termination Procedure



| DATA IT  | EM DESCRIPTION               | 2. NUMBER |
|----------|------------------------------|-----------|
| 1. TITLE | Spacecraft Test Data Package | 3. DATE   |
|          |                              |           |

To document and review the results of each test activity.

### 5. DATA REQUIREMENTS

The contractor shall evaluate the data taken during spacecraft integration and test for conformance with the spacecraft specification and programmatic requirements.

As a minimum, the data package shall contain:

- a. Test data
- b. Evidence of Quality Assurance acceptance data
- c. Listing of test requirements verified
- d. Summary description and commentary on the test data package
- e. Test procedures as run
- f. Test procedure change record listing
- g. Data trending
- h. (deleted)
- i. Configuration identification list
- j. Material review actions resulting from the tests
- k. Test equipment calibration data (not required for routine test equipment calibrations)
- l. Failure report listing and copies as required, (including status/resolution if completed by submittal)
- m. Burn-in data and failure free operation data
- n. (deleted)

CCR 4226C MOD 49

I&T-3.4.4-02

8/26/97

### 6. SPECIAL PREPARATION INSTRUCTIONS

Test Data Packages are to be submitted following major stages of spacecraft integration (BMT, PMT, IVT, etc.) And include an overview summary of the test period that has been covered with this submission. Data packages shall be delivered to GOES Resident Office for review and archival.



| DATA ITI | EM DESCRIPTION                   | 2. NUMBER | I&T-3.4.4-03 |
|----------|----------------------------------|-----------|--------------|
| 1. TITLE | Performance Verification Reports | 3. DATE   | 8/26/97      |

Provide summary of integration and testing results, conformance, non-conformance, and trend data.

### 5. DATA REQUIREMENTS

### A. GENERAL DATA REQUIREMENT

Performance verification reports are required for test activities commencing at component level testing for each spacecraft. Contents of these reports shall include, as a minimum:

- 1. Identification of the test article and test, to include: name of item, manufacturer, serial number, level of assembly, type of hardware (e.g. protoflight, spare), type of test, verification procedure number, and dates of testing.
- 2. Summary of the test results of each activity and an assessment of the quality and acceptability of the item tested.
- 3. Summary of the problems/failures occurring during the test and their resolution and corrective actions taken.
- 4. Trends in the performance of critical components.
- 5. Actual sequence of these operations including dates and times.
- 6. For each analysis activity, the report shall describe the degree to which the objectives were accomplished, how well the mathematical mode (for key GOES requirements) was validated by the test data, and other significant results.

### B. THERMAL VACUUM/THERMAL BALANCE TEST REPORTS

The thermal vacuum/thermal balance test report includes pre-test temperature predictions, test temperatures, a list of these components whose thermal balance test temperatures are outside the Mission Allowable Temperature limits, post-test predicted test temperatures correlating to  $\forall 5^{E}$ C of actual test temperatures and a description of what nodal model changes or test boundary changes were made to obtain the post test correlation.





| DATA ITE | EM DESCRIPTION                          | 2. NUMBER | I&T-3.4.4-03 |
|----------|---|-----------|--------------|
| 1. TITLE | Performance Verification Reports (Cont) | 3. DATE   | 8/26/97      |



### C. <u>MISCELLANEOUS REPORTS</u>

Verification reports shall be provided following the completion of the test activities that are described below:

- 1. Qualification testing of any component and/or assembly.
- 2. Life testing of any component or assembly.
- 3. Major tests such as the acoustic test, shock/vibration test, EMC/EMI test, and servo table testing of the attitude and orbit control subsystem components.
- 4. End-to-End Test Report following each End-to-End test.

Detailed test and analysis data supporting the verification reports shall be retained by the contractor. This data, as well as the as-run verification procedures, shall be available for review at the contractor's facility upon request.



### 6. SPECIAL PREPARATION INSTRUCTIONS

#### Note of Clarification:

This CDRL specifically applies to the test cases identified in Section 5 Paragraphs B & C and not to the spacecraft and component level testing that is covered by CDRL SFAT-3.3.1-02 Component and Subsystem Test Data Packages and CDRL I&T-3.4.4-02 Spacecraft Test Data Package.

Major tests are defined as test sequences performed at system level that when taken as a whole comprise the verification process for the specific requirements in question. For this contract, the major tests identified include: EMI/EMC; RF Airlink; Stray and Dipole Moment Magnetics; Acoustics, Vibration, and Shock; Launch Vehicle Adapter; Fit Check and Compatibility; System Functional Fit Test; S/C IMC Test; and S/C Dynamic Interaction Test.

CCR 4226C MOD 49





| DATA ITI | EM DESCRIPTION               | 2. NUMBER | I&T-3.4.6-01 |
|----------|------------------------------|-----------|--------------|
| 1. TITLE | Launch Site Integration Plan | 3. DATE   | 8/26/97      |

Provide documentation required to support launch operations. This document will be used as an input document for transmittal of all GOES requirements to ER and is the primary document used by ER for the preparation of their Launch Site Support Plan (LSSP) and Payload Requirements Document (PRD).

### 5. DATA REQUIREMENTS

The Launch Site Integration Plan shall define and document the support activities that are necessary for pre-launch activities and the technical aspects of launch operations. This plan shall describe the pre-launch checkout test plan and integration with the launch vehicle; participation in launch vehicle/spacecraft integrated systems test; and inspection, checkout, and fueling operations. All GFE facilities, services and materials must be specified in this document. This includes facilities required for spacecraft checkout and assembly, power, clean room provisions, office space, and communications.

The contractor shall document compliance with all ER safety training, security and Personal Reliability Program requirements.

This document should describe all aspects of the program while at the launch site. A suggested format for the Launch Site Integration Plan is given below:

#### 1.0 General

- 1.1 Plan Organization
- 1.2 Plan Scope
- 1.3 Applicable documents
- 1.4 Spacecraft Hazard System Summary

### 2.0 Pre-launch/Launch Test Operations Summary

- 2.1 Schedule
- 2.2 Layout of Equipment (each facility) including Test Equipment
- 2.3 Description of Events at Launch Site
  - 2.3.1 Spacecraft Delivery Operations
  - 2.3.2 Payload Processing Facility Operations
  - 2.3.3 Hazardous Processing Facility Operations
  - 2.3.4 Launch Complex Operations
- 2.4 Launch Hold Criteria
- 2.5 Environmental Requirements for Facilities During Transport



| DATA ITI | EM DESCRIPTION                      | 2. NUMBER | I&T-3.4.6-01 |
|----------|-------------------------------------|-----------|--------------|
| 1. TITLE | Launch Site Integration Plan (Cont) | 3. DATE   | 8/26/97      |



- 3.0 Test Facility Activation
  - 3.1 Activation Schedule
  - 3.2 Logistics Requirements
  - 3.3 Equipment Handling
  - 3.4 Maintenance
- 4.0 Administration
  - 4.1 Test Operations
- 5.0 Security Provision for Hardware/Software
- 6.0 Special Range Support Requirements
  - 6.1 Voice Communications
  - 6.2 Mission Control Operations



| DATA ITE | EM DESCRIPTION         | 2. NUMBER | I&T-3.4.6-02 |
|----------|------------------------|-----------|--------------|
| 1. TITLE | Launch Commit Criteria | 3. DATE   | 8/26/97      |

A list of conditions which must be met to proceed with launch.

### 5. DATA REQUIREMENTS

The contractor shall prepare and document the launch commit criteria, and document the criteria to be used to commit the GOES spacecraft for launch. The document shall address the spacecraft, GFE instruments, the spacecraft launch control center(s), launch critical GSE and associated activities prior to liftoff.

Each telemetry parameter shall be tabulated with its acceptable values, tolerances, and out-of-limits conditions which would require a resolution prior to launch.







| DATA IT  | EM DESCRIPTION              | 2. NUMBER | I&T-3.4.6-03 |
|----------|-----------------------------|-----------|--------------|
| 1. TITLE | Launch Site Test Procedures | 3. DATE   | 8/26/97      |

Defines the procedures for assembly, test, checkout and launch support of the GOES Spacecraft at ER.

#### 5. DATA REQUIREMENTS

The contractor shall provide all required procedures (in a format acceptable to ER (NASA) for test activities at ER. The procedures shall include, but are not limited to, the following areas:

- a. Spacecraft Power and Checkout
- b. Integrated Launch Vehicle Tests
- c. S/C testing with ground facilities
- d. Spacecraft Propellant Loading and Handling
- e. Emergency Contingency Operations
- f. Spacecraft Mating (inputs to ELV contractor's documentation)
- g. Spacecraft/Launch Vehicle Checkout (inputs to ELV contractor's documentation)
- h. GSE Checkout and Validation
- i. Ordnance Activities



| DATA ITEM DESCRIPTION |                        | 2. NUMBER | I&T-3.4.6-04 |
|-----------------------|------------------------|-----------|--------------|
| 1. TITLE              | Ground Operations Plan | 3. DATE   | 8/26/97      |

Provides a plan to obtain approval for use of the launch site facilities and resources and for the safety measures to be employed for spacecraft operations.

### 5. DATA REQUIREMENTS

The contractor shall submit a Ground Operations Plan (GOP) for each spacecraft to be launched. Contents shall be in accordance with Eastern and Western Range Safety Requirements 127-1. The GOP generation shall begin in the design phase and continue through the project development production and integration and test phases. The GOP must be approved by the launch range prior to the start of any hazardous operations on the range.

Each GOP submittal or supplemental submittal shall include addenda and updates required to ensure that the plan is current for each spacecraft launch.





| DATA ITEM DESCRIPTION |  | 2. NUMBER | I&T-3.4.6-05 |
|-----------------------|--|-----------|--------------|
| 1. TITLE              | Missile System Pre-Launch Safety Package | 3. DATE   | 8/26/97      |

Demonstrate that the spacecraft, its interfaces, GSE and procedures comply with ER and NASA Safety Requirements.

#### **5.DATA REQUIREMENTS**

The contractor shall submit a Missile System Pre-Launch Safety Package (MSPSP) for each spacecraft to be launched. Contents will be in accordance with Eastern and Western Range Safety Requirements 127-1. The safety assessment shall begin early in the design phase and continue through the project development effort. During the assessment, the contractor shall perform analysis and verification to identify the hazards associated with the mission hardware support equipment, related software, and their interfaces. There shall be revisions of this data package to reflect:

a. All changes made in the hazard control and safety assessment of the spacecraft, the ground support equipment or launch operation procedures since the last submittal.



b. All information and data that are peculiar to the individual spacecraft and its launch operations, such as GSE design changes, ground processing, related failure and accident summaries, open item lists, etc.

Each MSPSP submittal or supplemental submittal shall include addenda and updates required to ensure that the data package is current for each spacecraft launch.



| DATA ITE | EM DESCRIPTION                                | 2. NUMBER | I&T-3.4.9-01 |
|----------|---|-----------|--------------|
| 1. TITLE | Transportation and Handling Plan & Procedures | 3. DATE   | 8/26/97      |

Provide the plan for the transportation and handling of the spacecraft and ground support equipment during integration and test activity and transportation to the Eastern Range (ER).

#### 5. DATA REQUIREMENTS

#### A. TRANSPORTATION & HANDLING PLAN

The Transportation and Handling Plan shall incorporate details of the spacecraft and GSE during the integration and test flow sequence and the transportation from the contractor's plant to the ER. Requirements for air or ground shipment shall be specified. The shipping plan shall include all necessary planning and paperwork to support the transportation. These details shall include the following:

- 1. Ground and/or air shipment cargo loading and unloading procedures.
- 2. Cargo manifest including aircraft layout diagrams.
- 3. Staging area plans and diagrams.
- 4. Trip planning schedule of events, required support, route, contingency plans, permits.
- 5. Loading/unloading GSE and personnel required.
- 6. Requirements for pertinent calibration, special tools, fixtures, shipping containers, etc.
- 7. Transportation and handling flow plan for the spacecraft during manufacture, integration, testing and launch activity.

#### B. TRANSPORTATION & HANDLING PROCEDURE

The Transportation Procedures shall specify all of the step-by-step procedures for the handling and transporting of the spacecraft, instruments, spares, and GSE. The procedure shall include:

- 1. Special environmental conditions, such as cleanliness, temperature, humidity, etc.
- 2. Format for recording QA stamp, deviations, and approval columns.
- 3. Requirements for special tools, equipment, special handling fixtures, and containers.
- 4. Procedures to comply with local, state, and federal safety requirements.
- 5. Procedures for maintaining contact with the transported item (where applicable).

#### C. TRANSPORTATION LOG, AND PRE-SHIPMENT COORDINATION

The spacecraft contractor shall maintain a log of events and periodic environmental readings throughout all transportations. The time of significant and major events and unexpected environmental readings shall be recorded. All unexpected events shall be evaluated for their possible negative impact on the spacecraft and a discrepancy report shall be generated if considered to possibly affect spacecraft performance. The spacecraft contractor shall conduct pre-shipment coordination meetings with all involved parties at the plant, departing facility, and airport.







| DATA     | ITEM DESCRIPTION                                     | 2. NUMBER | I&T-3.4.9-01 |
|----------|--|-----------|--------------|
| 1. TITLE | Transportation and Handling Plan & Procedures (Cont) | 3. DATE   | 8/26/97      |



| DATA I   | TEM DESCRIPTION     | 2. NUMBER | I&T-3.4.10-01 |
|----------|---------------------|-----------|---------------|
| 1. TITLE | Ground Storage Plan | 3. DATE   | 8/26/97       |



This document shall provide the plan for implementing ground storage of the GOES-N, O, P, Q Spacecraft.

#### 5. DATA REQUIREMENTS

The contractor shall provide a detailed plan for ground storage of the GOES satellites. The storage plan shall describe the following:

- a. The stage in the S/C acceptance test flow sequence at which the S/C would be placed into ground storage.
- b. Spacecraft ground storage configuration, including which components (if any) would be removed for separate storage.
- c. Ground storage containers and environment and the associated instrumentation for monitoring the S/C and environment during storage.
- d. The schedule and extent of S/C testing and inspection during ground storage.
- e. Flight battery certification plan with the effects of the storage period on the expected inorbit lifetime.
- f. Impact of prolonged storage on S/C operational lifetime including expendables.
- g. Removal from storage, including retesting requirements.
- h. A plan for maintaining the readiness of the system test equipment, and Ground Support Equipment.
- i. The management plan for insuring availability of facilities and experienced personnel to support the storage and post-storage activities.
- j. The procedures and documentation plan for handling discrepancies and malfunctions found prior to and during the storage period.
- k. The call-up and activation plan and schedule with milestones and event span-times that will be followed after receipt of direction to remove the S/C from storage to meet a selected launch date.

#### 6. SPECIAL PREPARATION INSTRUCTIONS

The Ground Storage Plan shall incorporate the storage requirements for the GFE instruments.



| DATA I   | TEM DESCRIPTION  | 2. NUMBER | I&T-3.4.11-01 |
|----------|--|-----------|---------------|
| 1. TITLE | Assembly, Integration and Test Personnel Ground<br>System Training Package | 3. DATE   | 4/21/03       |

The spacecraft contractor shall develop a training package to train the spacecraft contractor System Test personnel in the SSGS elements in the UNIX environment.

### 5. DATA REQUIREMENTS

The I&T training package shall include the following elements:

- EPOCH
- NTACTS
- GTACS
- NT Client
- MRS&S
- DID
- GTS
- SITE

The training package shall include a ground system overview, sub-system interface diagrams, start-up/initialization, operational user's guide, fail-over/contingency, and maintenance procedures.

#### 6. SPECIAL PREPARATION INSTRUCTIONS

(Mod97, CCR 4364B)





| DATA I   | TEM DESCRIPTION   | 2. NUMBER | I&T-3.4.11-02 |
|----------|---|-----------|---------------|
| 1. TITLE | Spacecraft System Post-Storage Integration and Test<br>Training Package | 3. DATE   | 4/21/03       |

The spacecraft contractor shall develop a training package that shall be used by the spacecraft contractor's personnel in preparation for the spacecraft post-storage testing.

#### 5. DATA REQUIREMENTS

The spacecraft post-storage training package shall include post-storage integration activities, test plans, test sequence and shipment of the spacecraft to the launch facility. The sequence of events shall identify all the spacecraft test locations, fixtures, spacecraft Bus and Comm Payload STE, EGSE, MGSE, special instrumentation and software systems. The training package shall include test configuration and set-up, spacecraft and instrument safeing procedures, special shipping, handling and cleanliness requirements and processes, mechanical, harness and tech/sup training requirements, contamination requirements and processes (particulate, magnetic).

#### 6. SPECIAL PREPARATION INSTRUCTIONS



(Mod 97, CCR4364B)



| DATA I   | TEM DESCRIPTION  | 2. NUMBER | I&T-3.4.11-03 |
|----------|--|-----------|---------------|
| 1. TITLE | Spacecraft Thermal Vacuum (SCTV) Test Training Documentation | 3. DATE   | 4/21/03       |

The spacecraft contractor shall develop a training package that shall to be used by the spacecraft contractor's personnel in support of the spacecraft post-storage SCTV testing.

### 5. DATA REQUIREMENTS

The training package shall include the post-storage SCTV test plans and the sequence of events. The sequence of events shall identify all the spacecraft test locations, fixtures, GSE, special instrumentation and software systems. The training package shall include the test configuration and set-up, spacecraft and instrument safing procedures, special handling and cleanliness requirements and processes, mechanical, harness and tech/sup training requirements, contamination requirements and processes (particulate, magnetic).

### 6. SPECIAL PREPARATION INSTRUCTIONS



(Mod 97, CCR4364B)



| DATA I   | TEM DESCRIPTION                                | 2. NUMBER | I&T-3.4.11-04 |
|----------|--|-----------|---------------|
| 1. TITLE | Instrument Test and STE Training Documentation | 3. DATE   | 4/21/03       |

The spacecraft contractor shall develop a training package to be used by the spacecraft contractor's and the GFE instrument contractor's personnel in support of the spacecraft post-storage testing of the GFE Instruments.

### 5. DATA REQUIREMENTS

The training package shall include the post-storage instrument test set up plans and checkout as defined in Test Procedure # 903 (Imager and Sounder Test Configuration Support) and Test Procedure # 904 (SXI Test Configuration Support). The plans shall identify all the spacecraft test locations, fixtures, GSE, special instrumentation and software systems. The training shall include test configuration and set-up, special handling and cleanliness requirements and processes, mechanical, harness and tech/sup training requirements, contamination requirements and processes (particulate, magnetic). The imager and sounder instrument tests that complement TP # 903 are as follows:

| Test Description   | ITT Test # |
|--------------------|------------|
| EP Full Imager     | 8176982    |
| EP Full Sounder    | 8176981    |
| Coherent Noise     | 8177042    |
| Vis/Star Cal Im    | 8176989    |
| Vis/Star Cal Sndr  | 8176988    |
| System MTF Im      | 8177028    |
| MTF IGFOV Sndr     | 8177020    |
| Dyn coreg/shear    | 8177014    |
| Manual Deploy I/S  | 8177056    |
| Hinge Friction I/S | 8177055    |
|                    |            |

The SXI tests that complement TP # 904 are as follows:

#### Test Description

SXI Short Form Functional Test (SFFT)

SXI Long Form Functional Test (LFFT)

The training package shall also include documentation that addresses the following:

- Retrieval of test point cable set from storage
- Inspection and IR/Continuity checks of the test point cables
- The routing of the test point cables from GFCR into the test area
- The movement of the RTP from storage to the test area
- The integrated checkout of RTP to GTACS/Spacecraft interfaces (T&C, Wideband, and MDL).





| DATA | A ITEM DESCRIPTION   | j. | 2. NUMBER | GND-3.5.2-01 |
|------|--|----|-----------|--------------|
|      | Telemetry and Command System (GTACS) Design and Implementation |    | 3. DATE   | 8/26/97      |

The purpose of this item is to document the GOES N-Q Telemetry and Command System (GTACS) design, implementation, maintenance, training, and installation and test procedures.

#### 5. DATA REQUIREMENTS

#### Tasks

- 1. Document the detailed design of the GTACS
- 2. Provide GTACS hardware and software training and maintenance documentation and user guides.
- 3. Provide source, object, and executable code for each software configuration item.
- 4. Provide operation system licenses for hardware components delivered.
- 5. Provide documentation and COTS software licenses for all components on which they are installed.

### **Document Preparation Instructions**

The GTACS Design and Implementation document shall include the following parts, prepared in accordance with the applicable NOAA Standards S24.801 through S24.805, and including the following information:

- 1. GTACS System, Hardware, and Software Design
- 2. GTACS Installation Plan
  - a. Introduction
  - b. Statement of Purpose and Scope
  - c. Applicable Documents
  - d. Equipment List
  - e. Installation Area Layout
  - f. Equipment and Cabling Configuration
  - g. Installation Procedure and Constraints
  - h. Power and Environmental Conditions
  - i. Facility Access
  - i. Installation schedule
  - k. Accommodation with on-going Operational Environment
  - 1. Assumptions Regarding Expected/Needed Government Facilities and Support
- 3. Test Plans and procedures
  - a. GTACS Verification and Validation Plan
    - i. Introduction
    - ii. Statement of Purpose and Scope





| DATA     | ITEM DESCRIPTION  | 2. NUMBER | GND-3.5.2-01 |
|----------|---|-----------|--------------|
| 1. TITLE | Telemetry and Command System (GTACS) Design and Implementation (Cont) | 3. DATE   | 8/26/97      |

- iii. Applicable Documents
- v. Test Procedure and Data Management
- vi. Test Documentation
- vii.Test Verification Tracking
- viii.Test Resources
- ix. Test Discrepancy Management
- x. Test Methodology

### b. GTACS CM and QA Plan

- i. Introduction
- ii. Statement of Purpose and Scope
- iii. Applicable Documents
- iv. CM and QA Philosophy
- v. CM and QA Resources and Tools
- vi. Configuration Control Board Structure
- vii.Configuration Item Identification
- viii.Configuration Change Process
- ix. Configuration Auditing and Enforcement
- x. Configuration Documentation
- xi. Quality Evaluation Process
- c. GTACS Pre-Shipment Test Plan and Procedures, and Post-test Analysis
- d. GTACS Post-Shipment Test Plan and Procedures, and Post-test Analysis
- e. GTACS Preliminary Acceptance Test Plan and Procedures, and Post-test Analysis
- f. GTACS Integrated Ground Systems Test Plan and Procedures, and Post-test Analysis
- g. GTACS/Spacecraft Compatibility Test Plan and Procedures, and Post-test Analysis
- h. GTACS Final Acceptance Test Plan and Procedures, and Post-test Analysis

#### Test Plan requirements:

- a. Introduction
- b. Statement of Purpose and Scope
- c. Applicable Documents
- d. Test Methodology
- e. Test Procedure and Data Management
- f. Test Documentation
- g. Test Verification Tracking
- h. Test Resources





| DAT      | A ITEM DESCRIPTION  | 2. NUMBER | GND-3.5.2-01 |
|----------|---|-----------|--------------|
| A. TITLE | Telemetry and Command System (GTACS) Design and Implementation (Cont) | 3. DATE   | 8/26/97      |

- i. Test Discrepancy Management
- j. Testing Schedule

#### Test Procedure Requirements:

- a. Test Step Sequence
- b. Expected Result
- c. Test with In-Range and Out-of-Range Data

### Post-Test Analysis Requirements:

- a. Introduction
- b. Statement of Purpose and Scope
- c. Applicable Documents
- d. Testing Summary
- e. Test Analysis and Results
- f. Test Discrepancy Resolution
- g. Test Data

### 4. Training Documentation:

- a. GTACS Training Plan
  - i. Introduction
  - ii. Statement of Purpose and Scope
  - iii. Applicable Documents
  - iv. Training Resources
  - v. Training Course Structure
  - vi. Training Quality Assurance
  - vii. Consistency with S24.804 Requirements

# b. GTACS User/Operator Training and Users Manuals

- i. Introduction
- ii. Training Course Structure
- iii. Training Schedule
- iv. System and Operations Overview
- v. Operation Environment
- vi. Nominal Operation (lecture and lab)
- vii.Contingency Operation (lecture and lab)





| DATA | A ITEM DESCRIPTION  | 2. NUMBER | GND-3.5.2-01 |
|------|---|-----------|--------------|
|      | Telemetry and Command System (GTACS) Design and Implementation (Cont) | 3. DATE   | 8/26/97      |

- c. GTACS Software Maintenance Training Manuals
  - i. Introduction
  - ii. Training Course Structure
  - iii. Training Schedule
  - iv. System Overview
  - v. Software Maintenance Resources
  - vi. Software Maintenance Procedures
  - vii. Software and Database Organization and Structure
  - viii.Detailed Software Process Description
- d. GTACS Hardware Operations and Maintenance Training Manuals
  - i. Introduction
  - ii. Training Course Structure
  - iii. Training Schedule
  - iv. System Overview
  - v. Detailed Vendor and Custom Equipment Description
  - vi. Hardware Maintenance Procedures
  - vii. Hardware Corrective Maintenance Procedures
  - viii. Hardware Preventive Maintenance Procedures.





| DATA     | ITEM DESCRIPTION   | 2. NUMBER | GND-3.5.2-02 |
|----------|--|-----------|--------------|
| 1. TITLE | Telemetry Acquisition and Command Transmission System (NTACTS) Design and Implementation | 3. DATE   | 8/26/97      |

The purpose of this item is to document the GOES N-Q Telemetry Acquisition and Command Transmission System (NTACTS) design, implementation, maintenance, training, and installation and test procedures.

### 5. DATA REQUIREMENTS

#### Tasks

- 1. Document the detailed design of the NTACTS
- 2. Provide NTACTS hardware and software training and maintenance documentation and user guides.
- 3. Provide source, object, and executable code for each software configuration item.
- 4. Provide operating system licenses for hardware components delivered.
- 5. Provide documentation and COTS software licenses for all components on which they are installed.

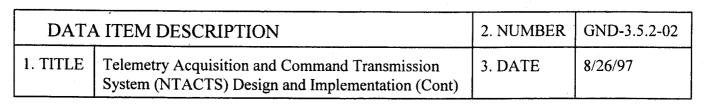


### **Document Preparation Instructions**

The NTACTS Design and Implementation document shall include the following parts, prepared in accordance with the applicable NOAA Standards S24.801 through S24.805, and including the following information:

- 1. NTACTS Design
- 2. NTACTS Installation Plan
  - a. Introduction
  - b. Statement of Purpose and Scope
  - c. Applicable Documents
  - d. Equipment List
  - e. Installation Area Layout
  - f. Equipment and Cabling Configuration
  - g. Installation Procedure and Constraints
  - h. Power and Environmental Conditions
  - i. Facility Access
  - j. Installation schedule
  - k. Accommodation with on-going Operational Environment
  - l. Assumptions Regarding Expected/Needed Government Facilities and Support





#### 3. Test Plans and procedures

- a. NTACTS Verification and Validation Plan
  - i. Introduction
  - ii. Statement of Purpose and Scope
  - iii. Applicable Documents
  - iv. Test Methodology
  - v. Test Procedure and Data Management
  - vi. Test Documentation
  - vii.Test Verification Tracking
  - viii. Test Resources
  - ix. Test Discrepancy Management
- b. NTACTS CM and QA Plan
  - i. Introduction
  - ii. Statement of Purpose and Scope
  - iii. Applicable Documents
  - iv. CM and QA Philosophy
  - v. CM and QA Resources and Tools
  - vi. Configuration Control Board Structure
  - vii.Configuration Item Identification
  - viii.Configuration Change Process
  - ix. Configuration Auditing and Enforcement
  - x. Configuration Documentation
  - xi. Quality Evaluation Process
- c. NTACTS Pre-Shipment Test Plan and Procedures, and Post-test Analysis
- d. NTACTS Post-Shipment Test Plan and Procedures, and Post-test Analysis
- e. NTACTS Preliminary Acceptance Test Plan and Procedures, and Post-test Analysis
- f. NTACTS Integrated Ground Systems Test Plan and Procedures, and Post-test Analysis
- g. NTACTS /Spacecraft Compatibility Test Plan and Procedures, and Post-test Analysis
- h. NTACTS Final Acceptance Test Plan and Procedures, and Post-test Analysis

#### Test Plan requirements:

- a. Introduction
- b. Statement of Purpose and Scope
- c. Applicable Documents
- d. Test Methodology
- e. Test Procedure and Data Management
- f. Test Documentation



| DATA     | A ITEM DESCRIPTION   | 2. NUMBER | GND-3.5.2-02 |
|----------|--|-----------|--------------|
| 1. TITLE | Telemetry Acquisition and Command Transmission<br>System (NTACTS) Design and Implementation (Cont) | 3. DATE   | 8/26/97      |

- g. Test Verification Tracking
- h. Test Resources
- i. Test Discrepancy Management
- j. Testing Schedule

#### Test Procedure Requirements:

- a. Test Step Sequence
- b. Expected Result
- c. Test with In-Range and Out-of-Range Data

#### Post-Test Analysis Requirements:

- a. Introduction
- b. Statement of Purpose and Scope
- c. Applicable Documents
- d. Testing Summary
- e. Test Analysis and Results
- f. Test Discrepancy Resolution
- g. Test Data

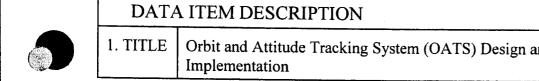
### 4. Training Documentation:

- a. NTACTS Training Plan
  - i. Introduction
  - ii. Statement of Purpose and Scope
  - iii. Applicable Documents
  - iv. Training Resources
  - v. Training Course Structure
  - vi. Training Quality Assurance
  - vii. Consistency with S24.804 Requirements
- b. NTACTS User/Operator Training Manuals
  - i. Introduction
  - ii. Training Course Structure
  - iii Training Schedule
  - iv. System and Operations Overview
  - v. Operation Environment
  - vi. Nominal Operation (lecture and lab)
  - vii.Contingency Operation (lecture and lab)



| DATA     | A ITEM DESCRIPTION   | 2. NUMBER | GND-3.5.2-02 |
|----------|--|-----------|--------------|
| 1. TITLE | Telemetry Acquisition and Command Transmission<br>System (NTACTS) Design and Implementation (Cont) | 3. DATE   | 8/26/97      |

- c. NTACTS Software Maintenance Training Manuals
  - i. Introduction
  - ii. Training Course Structure
  - iii. Training Schedule
  - iv. System Overview
  - v. Software Maintenance Resources
  - vi. Software Maintenance Procedures
  - vii. Software and Database Organization and Structure
  - viii.Detailed Software Process Description
- d. NTACTS Hardware Operations and Maintenance Training Manuals
  - i. Introduction
  - ii. Training Course Structure
  - iii. Training Schedule
  - iv. System Overview
  - v. Detailed Vendor and Custom Equipment Description
  - vi. Hardware Maintenance Procedures
  - vii. Hardware Corrective Maintenance Procedures
  - viii. Hardware Preventive Maintenance Procedures.



| ,   | 2. NUMBER | GND-3.5.2-03 |
|-----|-----------|--------------|
| ınd | 3. DATE   | 8/26/97      |

The purpose of this item is to document the GOES N-Q OATS design, implementation, maintenance, training, and installation and test procedures.

### 5. DATA REQUIREMENTS

#### Tasks

- 1. Document the N-Q OATS detailed design.
- 2. Provide N-Q OATS hardware and software training and maintenance documentation and user guides.
- 3. Provide source, object, and executable code for each software configuration item.
- 4. Provide operation system licenses for hardware components delivered.
- 5. Provide documentation and COTS software licenses for all components on which they are installed.

### **Document Preparation Instructions**

The OATS Design and Implementation document shall include the following parts, prepared in accordance with the applicable NOAA Standards S24.801 through S24.805, and including the following information:

- 1. OATS Design
- 2. OATS Installation Plan
  - a. Introduction
  - b. Statement of Purpose and Scope
  - c. Applicable Documents
  - d. Equipment List
  - e. Installation Area Layout
  - f. Equipment and Cabling Configuration
  - g. Installation Procedure and Constraints
  - h. Power and Environmental Conditions
  - i. Facility Access
  - j. Installation schedule
  - k. Accommodation with on-going Operational Environment
  - I. Assumptions Regarding Expected/Needed Government Facilities and Support



| DATA     | A ITEM DESCRIPTION   | 2. NUMBER | GND-3.5.2-03 |
|----------|--|-----------|--------------|
| 1. TITLE | Orbit and Attitude Tracking System (OATS) Design and Implementation (Cont) | 3. DATE   | 8/26/97      |

### 3. Test Plans and procedures

- a. OATS Verification and Validation Plan
  - i. Introduction
  - ii. Statement of Purpose and Scope
  - iii. Applicable Documents
  - iv. Test Methodology
  - v. Test Procedure and Data Management
  - vi. Test Documentation
  - vii. Test Verification Tracking
  - viii.Test Resources
  - ix. Test Discrepancy Management
- b. OATS CM and OA Plan
  - i. Introduction
  - ii. Statement of Purpose and Scope
  - iii. Applicable Documents
  - iv. CM and QA Philosophy
  - v. CM and QA Resources and Tools
  - vi. Configuration Control Board Structure
  - vii.Configuration Item Identification
  - viii.Configuration Change Process
  - ix. Configuration Auditing and Enforcement
  - x. Configuration Documentation
  - xi. Quality Evaluation Process
- c. OATS Pre-Shipment Test Plan and Procedures, and Post-test Analysis
- d. OATS Post-Shipment Test Plan and Procedures, and Post-test Analysis
- e. OATS Preliminary Acceptance Test Plan and Procedures, and Post-test Analysis
- f. OATS Integrated Ground Systems Test Plan and Procedures, and Post-test Analysis
- g. OATS Final Acceptance Test Plan and Procedures, and Post-test Analysis

#### Test Plan requirements:

- a. Introduction
- b. Statement of Purpose and Scope
- c. Applicable Documents
- d. Test Methodology
- e. Test Procedure and Data Management
- f. Test Documentation



| DATA     | A ITEM DESCRIPTION   | 2. NUMBER | GND-3.5.2-03 |
|----------|--|-----------|--------------|
| 1. TITLE | Orbit and Attitude Tracking System (OATS) Design and Implementation (Cont) | 3. DATE   | 8/26/97      |

- g. Test Verification Tracking
- h. Test Resources
- i. Test Discrepancy Management
- j. Testing Schedule

# Test Procedure Requirements:

- a. Test Step Sequence
- b. Expected Result
- c. Test with In-Range and Out-of-Range Data

### Post-Test Analysis Requirements:

- a. Introduction
- b. Statement of Purpose and Scope
- c. Applicable Documents
- d. Testing Summary
- e. Test Analysis and Results
- f. Test Discrepancy Resolution
- g. Test Data

### 4. Training Documentation:

- a. OATS Training Plan
  - i. Introduction
  - ii. Statement of Purpose and Scope
  - iii. Applicable Documents
  - iv. Training Resources
  - v. Training Course Structure
  - vi. Training Quality Assurance
  - vii. Consistency with S24.804 Requirements
- b. OATS User/Operator Training Manuals
  - i. Introduction
  - ii. Training Course Structure
  - iii. Training Schedule
  - iv. System and Operations Overview
  - v. Operation Environment
  - vi. Nominal Operation (lecture and lab)
  - vii.Contingency Operation (lecture and lab)



| DATA     | A ITEM DESCRIPTION   | 2. NUMBER | GND-3.5.2-03 |
|----------|--|-----------|--------------|
| 1. TITLE | Orbit and Attitude Tracking System (OATS) Design and Implementation (Cont) | 3. DATE   | 8/26/97      |

- c. OATS Software Maintenance Training Manuals
  - i. Introduction
  - ii. Training Course Structure
  - iii. Training Schedule
  - iv. System Overview
  - v. Software Maintenance Resources
  - vi. Software Maintenance Procedures
  - vii.Software and Database Organization and Structure
  - viii.Detailed Software Process Description
- d. OATS Hardware Operations and Maintenance Training Manuals
  - i. Introduction
  - ii. Training Course Structure
  - iii. Training Schedule
  - iv. System Overview
  - v. Detailed Vendor and Custom Equipment Description
  - vi. Hardware Maintenance Procedures
  - vii.Hardware Corrective Maintenance Procedures
  - viii. Hardware Preventive Maintenance Procedures.



| DATA     | A ITEM DESCRIPTION   | 2. NUMBER | GND-3.5.2-04 |
|----------|--|-----------|--------------|
| 1. TITLE | MDL Receive System & Archive (MRS&A) Design and Implementation | 3. DATE   | 8/26/97      |

The purpose of this item is to document the GOES N-Q MDL Receive System & Archive (MRS&A) design, implementation, maintenance, training, and installation and test procedures.

#### 5. DATA REQUIREMENTS

#### **Tasks**

- 1. Document the MRS&A detailed design
- 2. Provide N-Q MRS&A hardware and software training and maintenance documentation and user guide.
- 3. Provide source, object, and executable code for each software configuration item.
- 4. Provide operation system licenses for hardware components delivered.
- 5. Provide documentation and COTS software licenses for all components on which they are installed.

#### **Document Preparation Instructions**

The MRS&A Design and Implementation document shall include the following parts, prepared in accordance with the applicable NOAA Standards S24.801 through S24.805, and including the following information:

- 1. GOES N-Q Interface Specification
  - a. Introduction
  - b. SSGS Electrical Interface Characteristics
  - c. SSGS Interprocess Communication Message Formats
  - d. S/C to SSGS Interfaces.

#### 2. MRS&A Installation Plan

- a. Introduction
- b. Statement of Purpose and Scope
- c. Applicable Documents
- d. Equipment List
- e. Installation Area Layout
- f. Equipment and Cabling Configuration
- g. Installation Procedure and Constraints
- h. Power and Environmental Conditions
- i. Facility Access
- i. Installation schedule
- k. Accommodation with on-going Operational Environment
- 1. Assumptions Regarding Expected/Needed Government Facilities and Support





| DATA     | A ITEM DESCRIPTION  | 2. NUMBER | GND-3.5.2-04 |
|----------|---|-----------|--------------|
| 1. TITLE | MDL Receive System & Archive (MRS&A) Design and Implementation (Cont) | 3. DATE   | 8/26/97      |

#### 3. Test Plans and procedures

- a. MRS&A Verification and Validation Plan
  - i. Introduction
  - ii. Statement of Purpose and Scope
  - iii. Applicable Documents
  - iv. Test Methodology
  - v. Test Procedure and Data Management
  - vi. Test Documentation
  - vii.Test Verification Tracking
  - viii.Test Resources
  - ix. Test Discrepancy Management
- b. MRS&A CM and QA Plan
  - i. Introduction
  - ii. Statement of Purpose and Scope
  - iii. Applicable Documents
  - iv. CM and QA Philosophy
  - v. CM and QA Resources and Tools
  - vi. Configuration Control Board Structure
  - vii. Configuration Item Identification
  - viii.Configuration Change Process
  - ix. Configuration Auditing and Enforcement
  - x. Configuration Documentation
  - xi. Quality Evaluation Process
- c. MRS&A Pre-Shipment Test Plan and Procedures, and Post-test Analysis
- d. MRS&A Post-Shipment Test Plan and Procedures, and Post-test Analysis
- e. MRS&A Preliminary Acceptance Test Plan and Procedures, and Post-test Analysis
- f. MRS&A Integrated Ground Systems Test Plan and Procedures, and Post-test Analysis
- g. MRS&A/Spacecraft Compatibility Test Plan and Procedures, and Post-test Analysis
- h. MRS&A Final Acceptance Test Plan and Procedures, and Post-test Analysis

#### Test Plan requirements:

- a. Introduction
- b. Statement of Purpose and Scope
- c. Applicable Documents
- d. Test Methodology
- e. Test Procedure and Data Management



| DATA     | A ITEM DESCRIPTION  | 2. NUMBER | GND-3.5.2-04 |
|----------|---|-----------|--------------|
| 1. TITLE | MDL Receive System & Archive (MRS&A) Design and Implementation (Cont) | 3. DATE   | 8/26/97      |

- f. Test Documentation
- g. Test Verification Tracking
- h. Test Resources
- i. Test Discrepancy Management
- j. Testing Schedule

## Test Procedure Requirements:

- a. Test Step Sequence
- b. Expected Result
- c. Test with In-Range and Out-of-Range Data

## Post-Test Analysis Requirements:

- a. Introduction
- b. Statement of Purpose and Scope
- c. Applicable Documents
- d. Testing Summary
- e. Test Analysis and Results
- f. Test Discrepancy Resolution
- g. Test Data

# 4. Training Documentation:

- a. MRS&A Training Plan
  - i. Introduction
  - ii. Statement of Purpose and Scope
  - iii. Applicable Documents
  - iv. Training Resources
  - v. Training Course Structure
  - vi. Training Quality Assurance
  - vii.Consistency with S24.804 Requirements
- b. MRS&A User/Operator Training Manuals
  - i. Introduction
  - ii. Training Course Structure
  - iii. Training Schedule
  - iv. System and Operations Overview
  - v. Operation Environment
  - vi. Nominal Operation (lecture and lab)
  - vii.Contingency Operation (lecture and lab)

| DATA     | A ITEM DESCRIPTION  | 2. NUMBER | GND-3.5.2-04 |
|----------|---|-----------|--------------|
| 1. TITLE | MDL Receive System & Archive (MRS&A) Design and Implementation (Cont) | 3. DATE   | 8/26/97      |

- c. MRS&A Software Maintenance Training Manuals
  - i. Introduction
  - ii. Training Course Structure
  - iii. Training Schedule
  - iv. System Overview
  - v. Software Maintenance Resources
  - vi. Software Maintenance Procedures
  - vii. Software and Database Organization and Structure
  - viii.Detailed Software Process Description
- d. MRS&A Hardware Operations and Maintenance Training Manuals
  - i. Introduction
  - ii. Training Course Structure
  - iii. Training Schedule
  - iv. System Overview
  - v. Detailed Vendor and Custom Equipment Description
  - vi. Hardware Maintenance Procedures
  - vii. Hardware Corrective Maintenance Procedures
  - viii. Hardware Preventive Maintenance Procedures.



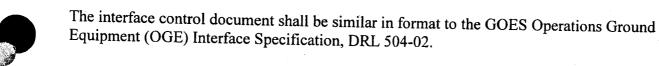
| DATA     | A ITEM DESCRIPTION                                       | 2. NUMBER | GND-3.5.2-05 |
|----------|--|-----------|--------------|
| 1. TITLE | Spacecraft Support Ground System Interface Specification | 3. DATE   | 8/26/97      |

The purpose of this item is to document the GOES N-Q Spacecraft Support Ground System (SSGS) interfaces.

# 5. DATA REQUIREMENTS

#### **Tasks**

- 1. Document the electrical and mechanical interfaces among all SSGS elements.
- 2. Document the SSGS Network design.
- 3. Document SSGS interprocess communications messages, formats, and protocols.



| <b>'</b> |  |  |  |
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| DATA     | A ITEM DESCRIPTION   | 2. NUMBER | GND-3.5.2-06 |
|----------|--|-----------|--------------|
| 1. TITLE | Dynamic Interaction Diagnostic (DID) Design and Implementation | 3. DATE   | 8/26/97      |

The purpose of this item is to document the GOES N-Q DID design, implementation, maintenance, training, and installation and test procedures.

### 5. DATA REQUIREMENTS

#### **Tasks**

- 1. Document the N-Q DID detailed design.
- 2. Provide N-Q OATS hardware and software training and maintenance documentation and user guides.
- 3. Provide source, object, and executable code for each software configuration item.
- 4. Provide operation system licenses for hardware components delivered.
- 5. Provide documentation and COTS software licenses for all components on which they are installed.

## **Document Preparation Instructions**

The DID Design and Implementation document shall include the following parts, prepared in accordance with the applicable NOAA Standards S24.801 through S24.805, and including the following information:

- 1. DID Design
- 2. DID Installation Plan
  - a. Introduction
  - b. Statement of Purpose and Scope
  - c. Applicable Documents
  - d. Equipment List
  - e. Installation Area Layout
  - f. Equipment and Cabling Configuration
  - g. Installation Procedure and Constraints
  - h. Power and Environmental Conditions
  - i. Facility Access
  - j. Installation schedule
  - k. Accommodation with on-going Operational Environment
  - I. Assumptions Regarding Expected/Needed Government Facilities and Support

| DATA     | A ITEM DESCRIPTION  | 2. NUMBER | GND-3.5.2-06 |
|----------|---|-----------|--------------|
| 1. TITLE | Dynamic Interaction Diagnostic (DID) Design and Implementation (Cont) | 3. DATE   | 8/26/97      |

# 3. Test Plans and procedures

- a. DID Verification and Validation Plan
  - i. Introduction
  - ii. Statement of Purpose and Scope
  - iii. Applicable Documents
  - iv. Test Methodology
  - v. Test Procedure and Data Management
  - vi. Test Documentation
  - vii. Test Verification Tracking
  - viii.Test Resources
  - ix. Test Discrepancy Management
- b. DID CM and QA Plan
  - i. Introduction
  - ii. Statement of Purpose and Scope
  - iii. Applicable Documents
  - iv. CM and QA Philosophy
  - v. CM and QA Resources and Tools
  - vi. Configuration Control Board Structure
  - vii.Configuration Item Identification
  - viii.Configuration Change Process
  - ix. Configuration Auditing and Enforcement
  - x. Configuration Documentation
  - xi. Quality Evaluation Process
- c. DID Pre-Shipment Test Plan and Procedures, and Post-test Analysis
- d. DID Post-Shipment Test Plan and Procedures, and Post-test Analysis
- e. DID Preliminary Acceptance Test Plan and Procedures, and Post-test Analysis
- f. DID Integrated Ground Systems Test Plan and Procedures, and Post-test Analysis
- g. DID Final Acceptance Test Plan and Procedures, and Post-test Analysis

## Test Plan requirements:

- a. Introduction
- b. Statement of Purpose and Scope
- c. Applicable Documents
- d. Test Methodology
- e. Test Procedure and Data Management
- f. Test Documentation

| DATA     | A ITEM DESCRIPTION  | 2. NUMBER | GND-3.5.2-06 |  |
|----------|---|-----------|--------------|--|
| 1. TITLE | Dynamic Interaction Diagnostic (DID) Design and Implementation (Cont) | 3. DATE   | 8/26/97      |  |

- g. Test Verification Tracking
- h. Test Resources
- i. Test Discrepancy Management
- j. Testing Schedule

# Test Procedure Requirements:

- a. Test Step Sequence
- b. Expected Result
- c. Test with In-Range and Out-of-Range Data

# Post-Test Analysis Requirements:

- a. Introduction
- b. Statement of Purpose and Scope
- c. Applicable Documents
- d. Testing Summary
- e. Test Analysis and Results
- f. Test Discrepancy Resolution
- g. Test Data

# 4. Training Documentation:

- a. DID Training Plan
  - i. Introduction
  - ii. Statement of Purpose and Scope
  - iii. Applicable Documents
  - iv. Training Resources
  - v. Training Course Structure
  - vi. Training Quality Assurance
  - vii. Consistency with S24.804 Requirements
- b. DID User/Operator Training Manuals
  - i. Introduction
  - ii. Training Course Structure
  - iii. Training Schedule
  - iv. System and Operations Overview
  - v. Operation Environment
  - vi. Nominal Operation (lecture and lab)
  - vii.Contingency Operation (lecture and lab)

| DATA     | ITEM DESCRIPTION  | 2. NUMBER | GND-3.5.2-06 |
|----------|---|-----------|--------------|
| 1. TITLE | Dynamic Interaction Diagnostic (DID) Design and Implementation (Cont) | 3. DATE   | 8/26/97      |

- c. DID Software Maintenance Training Manuals
  - i. Introduction
  - ii. Training Course Structure
  - iii. Training Schedule
  - iv. System Overview
  - v. Software Maintenance Resources
  - vi. Software Maintenance Procedures
  - vii. Software and Database Organization and Structure
  - viii.Detailed Software Process Description
- d. DID Hardware Operations and Maintenance Training Manuals
  - i. Introduction
  - ii. Training Course Structure
  - iii. Training Schedule
  - iv. System Overview
  - v. Detailed Vendor and Custom Equipment Description
  - vi. Hardware Maintenance Procedures
  - vii.Hardware Corrective Maintenance Procedures
  - viii. Hardware Preventive Maintenance Procedures.



| DATA     | A ITEM DESCRIPTION              | 2. NUMBER | OPS-3.6.1-01 |
|----------|---------------------------------|-----------|--------------|
| 1. TITLE | Spacecraft Operations Handbooks | 3. DATE   | 8/26/97      |

The contractor shall provide comprehensive documentation on all aspects of spacecraft operations in a multi-volume set collectively called the Spacecraft Operations Handbook (SOH).

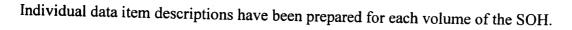
# 5. DATA REQUIREMENTS

All necessary and sufficient information required for spacecraft operation, analysis, and anomaly resolution.

Topics to be addressed in the SOH include:

- 1. Detailed mission profile and spacecraft descriptions
- 2. Launch, orbit raising, normal on-orbit, contingency operations, and on orbit storage
- 3. All spacecraft specific data for GOES N, GOES O, GOES P, and GOES Q

GFE instrument operations information will be integrated to provide a single, comprehensive reference for the entire satellite.



# 6. SPECIAL PREPARATION INSTRUCTIONS

Electronic format of SOH volumes shall have ability to hyperlink to other SOH Volumes and other contractor supplied operations documents.



| DATA     | ITEM DESCRIPTION                                       | 2. NUMBER | OPS-3.6.1-01 |
|----------|--|-----------|--------------|
| 1. TITLE | SOH- Volume 1<br>Mission Profile and Launch Operations | 3. DATE   | 8/26/97      |

SOH Volume 1 shall provide a detailed mission analysis including a description of the purpose and scope of mission. Also volume 1 shall include the detailed descriptions of all pre-launch activities, and launch and transfer orbit operations. A comprehensive list of applicable manufacturer's and industry's acronyms will be provided.

## 5. DATA REQUIREMENTS

Provide detailed launch operations and procedures including:

- 1. Pre-Launch Activities how and when the spacecraft is configured at the launch facility.
- 2. Launch and Orbital Consideration includes mission impacts of injection accuracy, solar and lunar aspects, sensor FOVs, power availability, sizing and payload capabilities of spacecraft engines, available telemetry during maneuvers, maneuver profiles, burn durations, fuel and mass margins, maneuver abort criteria, engine thermal characteristics and thruster alignment data.
- 3. Spacecraft Launch Constraints list of all conditions required for the launch to take place and a list of all conditions which would preclude launch. Detailed explanations of all GO/NOGO criteria.
- 4. Launch Vehicle Characteristics -overview of relevant information including available spacecraft telemetry during launch, launch profile, burn durations, fuel and mass margins, and final separation configuration.
- 5. Ground Station Coverage predicted station availability (look angles, maximum elevation, support duration, possible site conflicts) as function of launch date and time. Detailed description of all external element interfaces to the NOAA SOCC and Ground Network (GN) sites.
- 6. T&C Requirements All telemetry monitoring and command execution required between launch and checkout orbit injection
- 7. Detailed Launch Timeline-specific sequence of activities to be carried out from launch until orbital checkout station attainment until engineering handover, including deployment of appendages and spacecraft functional checkout.
- 8. Launch Communications/Data Flow Requirements All requirements for data or communications during launch including data rates, line availability, duration of service, etc.



| DATA I | TEM DESCRIPTION   | 2. NUMBER | OPS-3.6.1-01 |
|--------|---|-----------|--------------|
|        | SOH- Volume 1<br>Mission Profile and Launch Operations (Cont) | 3. DATE   | 8/26/97      |

# 5. DATA REQUIREMENTS (CONT)

9. The mission profile design shall allow any target longitude to be selected by NASA for station checkout and operations. The mission profile shall be designed to ensure that the spacecraft shall be on orbit at the checkout station within 15 days from launch and functional checkout will be completed within 21 days of launch.



| DATA     | ITEM DESCRIPTION                      | 2. NUMBER | OPS-3.6.1-01 |
|----------|---------------------------------------|-----------|--------------|
| 1. TITLE | SOH Volume 2 - Contingency Operations | 3. DATE   | 8/26/97      |

To provide detailed description of contingency prevention, detection, and manufacturer's recommended response to deviations from expected launch and operational modes.

#### 5. DATA REQUIREMENTS

**Contingency Operations Procedures** 

Describe for each mission phase, in flow chart form, every use of telemetered data to assure the spacecraft is operating within expected conditions. Also, describe in flow chart form, the immediate actions to be taken by the operations staff when each of these expected conditions is not true. Include exact telemetry to be monitored and all commands to be sent. The flow charts will highlight operations including single points of failure which exists on the as-built spacecraft.

Redundant Devices, Components and Systems -

For each redundant device, component, and system, describe how the unit is switched to its backup unit and all operational impacts of performing the switch to the backup side.







| DATA I   | TEM DESCRIPTION                       | 2. NUMBER | OPS-3.6.1-01 |
|----------|---------------------------------------|-----------|--------------|
| 1. TITLE | SOH Volume 3 - Spacecraft Description | 3. DATE   | 8/26/97      |

To provide supporting documents for the development of spacecraft operations procedures and practices, to assist in overall understanding of spacecraft systems

## 5. DATA REQUIREMENTS

Subsystem Descriptions

Detailed component-level description of operation of each subsystem and payload including operational constraints and all interactions with other subsystems and payloads. Includes simplified block diagrams and references appropriate sections of volume 2.



| DATA I   | TEM DESCRIPTION                    | 2. NUMBER | OPS-3.6.1-01 |
|----------|------------------------------------|-----------|--------------|
| 1. TITLE | SOH Volume 4 - On-orbit Operations | 3. DATE   | 8/26/97      |

To Provide Guidance in the Routine Operations of the Mission.

### 5. DATA REQUIREMENTS

- a. Satellite On Orbit Capabilities and Operating Modes
- b. Describe the performance capabilities of all subsystems when in the On Orbit Configuration. Describe each possible operating mode, means of transition, and constraints on operation in each mode.
- c. Standard Operating Procedures
- d. Spacecraft manufacturer's recommendations as to how daily spacecraft and changed ground data processing should be performed. This does not include GFE operations.
- e. Special Event Operations
- f. Describe all routine maintenance events such as orbit adjustments, momentum unloadings, and solar array adjustments
- g. Performance Assessment
- h. Provide detailed description of which parameters are to be trended and at what frequency.
- i. Describe the on-orbit storage operations, i.e., recommend pre-storage operations activities, recommended on-orbit storage operations and recommended operations needed to remove the S/C from storage and placed into operation.
- j. Recommend parameters to be trended and the frequency of the trending activities.



| DATA I   | TEM DESCRIPTION   | 2. NUMBER | OPS-3.6.1-01 |
|----------|---|-----------|--------------|
| 1. TITLE | SOH Volume 5 - on Board Computer (OBC) User's Operations and Maintenance Manual | 3. DATE   | 8/26/97      |

To provide detailed understanding of how the OBC is operated

### 5. DATA REQUIREMENTS

Overview of basic OBC performance specifications

Functional block diagrams of interfaces to all other satellite systems, including T&C, Power, Attitude Control and Payloads.

Detailed discussion of basic OBC operations, including initialization, redundancy switching and diagnostic capabilities.



| DATA I   | TEM DESCRIPTION                     | 2. NUMBER | OPS-3.6.1-01 |
|----------|-------------------------------------|-----------|--------------|
| 1. TITLE | SOH Volume 6 - GOES N Specific Data | 3. DATE   | 8/26/97      |

To provide the data unique to GOES N.

#### 5. DATA REQUIREMENTS

Provide all data needed to assess the health and safety of this specific satellite including:

- 1. Calibration Curves Calibration data used by the ground system to interpret the narrowband, wideband, and MDL telemetry streams. Includes both analog and digital telemetry.
- 2. Telemetry Limits Three type of limits shall be provided. Red Limits, Yellow Limits, and Design/Operations Limits. Red limits are the values above or below which the operator must take action to prevent the loss of the component. Yellow limits are those for which the operator must act to prevent damage to the component. Design/Operations limits are the values which the component remains with throughout the nominal mission.
- 3. Mass Properties Sequenced list of center of mass, moments and products of inertia for every possible mission configurations and phase, including before and after each deployment, ascent maneuver, on station, and end of life conditions.
- 4. Power Measured power for each unit, power budget summary including load uncertainty, predicted solar array output, and predicted battery charge performance.
- 5. Communications Link Margins Bandpass response, output power and frequency for all transmitters, frequency ratios for all transponders, and sensitivity thresholds for all receivers.
- 6. Sensor/Actuator Alignment Data Forces and torques which correspond to the motion of the spacecraft center of mass. Impingement of thrusters on spacecraft components. Solar induced torque predictions. Alignment data of all sensors and actuators.
- 7. Deployable Torque Margins Available torque, required torque, and remaining torque for all deployables.
- 8. Propulsion Thruster performance, including thrust, specific impulse, mixture ratios, flow rates, and efficiencies. Thermal ramifications of long duration burns.

| DATA     | A ITEM DESCRIPTION                         | 2. NUMBER | OPS-3.6.1-01 |
|----------|--|-----------|--------------|
| 1. TITLE | SOH Volume 6 - GOES N Specific Data (Cont) | 3. DATE   | 8/26/97      |

## 5. DATA REQUIREMENTS (CONT)

9. Derived Last Recorded Values – Description of the DLRVs contained in the latest database version, including; DLRV name, number, state label, input dependences, textual and algorithmic descriptions. The delivery shall be provided in a format that is editable by MS Word. (CCR4344A, Mod 96)

### 6. SPECIAL PREPARATION INSTRUCTIONS

The contractor shall update this document as required throughout the mission.

| DATA I   | TEM DESCRIPTION                     | 2. NUMBER | OPS-3.6.1-01 |
|----------|-------------------------------------|-----------|--------------|
| 1. TITLE | SOH Volume 7 - GOES O Specific Data | 3. DATE   | 8/26/97      |

To provide the data unique to GOES O.

#### 5. DATA REQUIREMENTS

Provide all data needed to assess the health and safety of this specific satellite including:

- 1. Calibration Curves Calibration data used by the ground system to interpret the narrow band, wideband, and MDL telemetry streams. Includes both analog and digital telemetry.
- 2. Telemetry Limits Three type of limits shall be provided. Red Limits, Yellow Limits, and Design/Operations Limits. Red limits are the values above or below which the operator must take action to prevent the loss of the component. Yellow limits are those for which the operator must act to prevent damage to the component. Design/Operations limits are the values which the component remains with throughout the nominal mission.
- 3. Mass Properties Sequenced list of center of mass, moments and products of inertia for every possible mission configurations and phase, including before and after each deployment, ascent maneuver, on station, and end of life conditions.
- 4. Power Measured power for each unit, power budget summary including load uncertainty, predicted solar array output, and predicted battery charge performance.
- 5. Communications Link Margins Bandpass response, output power and frequency for all transmitters, frequency ratios for all transponders, and sensitivity thresholds for all receivers.
- 6. Sensor/Actuator Alignment Data Forces and torques which correspond to the motion of the spacecraft center of mass. Impingement of thrusters on spacecraft components. Solar induced torque predictions. Alignment data of all sensors and actuators.
- 7. Deployable Torque Margins Available torque, required torque, and remaining torque for all deployables.
- 8. Propulsion Thruster performance, including thrust, specific impulse, mixture ratios, flow rates, and efficiencies. Thermal ramifications of long duration burns.



| DATA     | ITEM DESCRIPTION                           | 2. NUMBER | OPS-3.6.1-01 |
|----------|--|-----------|--------------|
| 1. TITLE | SOH Volume 7 - GOES O Specific Data (Cont) | 3. DATE   | 8/26/97      |

# 5. DATA REQUIREMENTS (CONT)

9. Derived Last Recorded Values – Description of the DLRVs contained in the latest database version, including; DLRV name, number, state label, input dependences, textual and algorithmic descriptions. The delivery shall be provided in a format that is editable by MS Word. (CCR4344A, Mod 96)

## 6. SPECIAL PREPARATION INSTRUCTIONS

The contractor shall update this document as required throughout the mission

| DATA I   | TEM DESCRIPTION                     | 2. NUMBER | OPS-3.6.1-01 |
|----------|-------------------------------------|-----------|--------------|
| 1. TITLE | SOH Volume 8 - GOES P Specific Data | 3. DATE   | 8/26/97      |

To provide the data unique to GOES P.

### 5. DATA REQUIREMENTS

Provide all data needed to assess the health and safety of this specific satellite including:

- 1. Calibration Curves Calibration data used by the ground system to interpret the narrow band, wideband, and MDL telemetry streams. Includes both analog and digital telemetry.
- 2. Telemetry Limits Three type of limits shall be provided. Red Limits, Yellow Limits, and Design/Operations Limits. Red limits are the values above or below which the operator must take action to prevent the loss of the component. Yellow limits are those for which the operator must act to prevent damage to the component. Design/Operations limits are the values which the component remains with throughout the nominal mission.
- 3. Mass Properties Sequenced list of center of mass, moments and products of inertia for every possible mission configurations and phase, including before and after each deployment, ascent maneuver, on station, and end of life conditions.
- 4. Power Measured power for each unit, power budget summary including load uncertainty, predicted solar array output, and predicted battery charge performance.
- 5. Communications Link Margins Bandpass response, output power and frequency for all transmitters, frequency ratios for all transponders, and sensitivity thresholds for all receivers.
- 6. Sensor/Actuator Alignment Data Forces and torques which correspond to the motion of the spacecraft center of mass. Impingement of thrusters on spacecraft components. Solar induced torque predictions. Alignment data of all sensors and actuators.
- 7. Deployable Torque Margins Available torque, required torque, and remaining torque for all deployables.
- 8. Propulsion Thruster performance, including thrust, specific impulse, mixture ratios, flow rates, and efficiencies. Thermal ramifications of long duration burns.



| DATA     | ITEM DESCRIPTION                           | 2. NUMBER | OPS-3.6.1-01 |
|----------|--|-----------|--------------|
| 1. TITLE | SOH Volume 8 - GOES P Specific Data (Cont) | 3. DATE   | 8/26/97      |

### 5. DATA REQUIREMENTS (CONT)

9. Derived Last Recorded Values – Description of the DLRVs contained in the latest database version, including; DLRV name, number, state label, input dependences, textual and algorithmic descriptions. The delivery shall be provided in a format that is editable by MS Word. (CCR4344A, Mod 96)





| DATA     | TEM DESCRIPTION                     | 2. NUMBER | OPS-3.6.1-01 |
|----------|-------------------------------------|-----------|--------------|
| 1. TITLE | SOH Volume 9 - GOES Q Specific Data | 3. DATE   | 8/26/97      |

To provide the data unique to GOES Q.

### 5. DATA REQUIREMENTS

Provide all data needed to assess the health and safety of this specific satellite including:

- 1. Calibration Curves Calibration data used by the ground system to interpret the narrow band, wideband, and MDL telemetry streams. Includes both analog and digital telemetry.
  - 2. Telemetry Limits Three type of limits shall be provided. Red Limits, Yellow Limits, and Design/Operations Limits. Red limits are the values above or below which the operator must take action to prevent the loss of the component. Yellow limits are those for which the operator must act to prevent damage to the component. Design/Operations limits are the values which the component remains with throughout the nominal mission.
  - 3. Mass Properties Sequenced list of center of mass, moments and products of inertia for every possible mission configurations and phase, including before and after each deployment, ascent maneuver, on station, and end of life conditions.
  - 4. Power Measured power for each unit, power budget summary including load uncertainty, predicted solar array output, and predicted battery charge performance.
  - 5. Communications Link Margins Bandpass response, output power and frequency for all transmitters, frequency ratios for all transponders, and sensitivity thresholds for all receivers.
- Sensor/Actuator Alignment Data Forces and torques which correspond to the
  motion of the spacecraft center of mass. Impingement of thrusters on spacecraft
  components. Solar induced torque predictions. Alignment data of all sensors and
  actuators.
- 7. Deployable Torque Margins Available torque, required torque and remaining torque for all deployables.
- 8. Propulsion Thruster performance, including thrust, specific impulse, mixture ratios, flow rates, and efficiencies. Thermal ramifications of long duration burns.





| DATA     | ITEM DESCRIPTION                           | 2. NUMBER | OPS-3.6.1-01 |
|----------|--|-----------|--------------|
| 1. TITLE | SOH Volume 9 - GOES Q Specific Data (Cont) | 3. DATE   | 8/26/97      |

# 6. SPECIAL PREPARATION INSTRUCTIONS

The contractor shall update this document as required throughout the mission



| DATA I   | TEM DESCRIPTION                  | 2. NUMBER | OPS-3.6.1-02 |
|----------|----------------------------------|-----------|--------------|
| 1. TITLE | Spacecraft Training Program Plan | 3. DATE   | 8/26/97      |

The contractor shall define and describe training required to prepare the operations staff with complete understanding of spacecraft/SSGS operations modes and anomaly recovery.

#### 5. DATA REQUIREMENTS

Describe how the contractor will train the Government personnel in spacecraft and instrument operations and engineering. The plan shall include:

Training Concept
Overview and System Description
Training Organization and Staffing Levels
Schedules
Unique Requirements
Knowledge, Skills, Prerequisites and Proficiency Level of Students
Test and Certification Criteria
Training Course Descriptions, Objectives and Content
Description of Training Facilities
Methodology Used to Assess Results of Training
Reports and Documentation Furnished for the Training



### 6. SPECIAL PREPARATION INSTRUCTIONS

Document shall be prepared in accordance with NASA/GSFC 535-TIP-CPT-001, Contractor-Provided Training Specification.

Contractor shall update the training plan as required throughout the mission, as needed for design upgrades and payload changes.



| DATA I   | TEM DESCRIPTION                    | 2. NUMBER | OPS-3.6.1-03 |
|----------|------------------------------------|-----------|--------------|
| 1. TITLE | Spacecraft Mission Operations Plan | 3. DATE   | 8/26/97      |

Provide an overview of all contractors mission operations support activities.

### 5. DATA REQUIREMENTS

The Mission Operations Plan shall include the following minimum material.

- a. Mission operations organization for all launch and on-orbit phases
- b. Overview of Mission Profile through spacecraft end-of-life
- c. Characteristics of Ground Network for all launch and on-orbit phases
- d. Overview of ETE program
- e. Overview of spacecraft operations timelines for all launch and on-orbit phases

4226C MOD 49

- f. Ground system operations and INR Performance Verification
- g. Staffing Plan for mission duration
- h. Orbit Determination/Maneuver Planning Methodology





| DATA I   | TEM DESCRIPTION                  | 2. NUMBER | OPS-3.6.2-01 |
|----------|----------------------------------|-----------|--------------|
| 1. TITLE | Spacecraft On-Orbit Storage Plan | 3. DATE   | 8/26/97      |

Provide a plan for implementing on-orbit storage of the GOES Satellites.

## 5. DATA REQUIREMENTS

The contractor shall provide a detailed plan for on-orbit storage of the GOES satellites. The On-Orbit Storage Plan shall describe the following:

- a. Impact of prolonged storage on S/C operational lifetime, including expendables.
- b. Spacecraft requirements for communications and control during on-orbit storage.
- c. Define and describe recommended on-orbit S/C storage mode configuration including GFE instruments, operations constraints and requirements, including analyses when appropriate, to support proposed recommendations.
- d. Recommended plan for removal from on-orbit storage, including recommended retest plan.
- e. Spacecraft operations personnel requirements for monitoring S/C health and safety, including any necessary S/C commanding operations.
- f. Recommended spacecraft telemetry points and telemetry limits that should be monitored by the NOAA operations personnel.









| DATA ITEM DESCRIPTION |                          | 2. NUMBER | OPS-3.6.2-02 |
|-----------------------|--------------------------|-----------|--------------|
| 1. TITLE              | Spacecraft De-orbit Plan | 3. DATE   | 8/26/97      |

Provides detailed de-orbit and spacecraft Shut down procedures.

## 5. DATA REQUIREMENTS

This plan includes estimated end of life system requirements to achieve proper super-synchronous orbit.

This plan details the exact order of operations required to perform and verify the controlled termination of the mission.

Provide criteria for decision to end spacecraft lifetime. Describe detailed procedure for placing spacecraft beyond geosynchronous orbit and performing a controlled turn off of all satellite subsystems and payloads.



# 6. SPECIAL PREPARATION INSTRUCTIONS

This document shall be included with the Debris Generation Analysis Report CDRL item SE-2.5-05.



| DATA I   | TEM DESCRIPTION                        | 2. NUMBER | OPS-3.6.3-01 |
|----------|--|-----------|--------------|
| 1. TITLE | Spacecraft Engineering Handover Review | 3. DATE   | 8/26/97      |

Provide government personnel with a status of the spacecraft at the start of Post Launch Testing (PLT)

### 5. DATA REQUIREMENTS

# The spacecraft contractor shall provide the following information in this review:

- 1. Detailed spacecraft equipment configuration
- 2. Detailed FSW configuration (status of RAM data changed since launch)
- 3. List of any spacecraft equipment not used by HSC post-launch
- 4. List of FSW modes not used by HSC post-launch
- 5. Current spacecraft orbit solution (on day of handover)
- 6. Current spacecraft propellant remaining
- 7. List of current HSC operations objective liens (i.e., what did HSC not get done)
- 8. Description of any new operational constraints and procedure changes
- 9. List of all anomalies and
  - a. Current status of their investigation and resolution
  - b. Description of any operational workarounds implemented
- 10. List of all ground system problems encountered and
  - a. Current status of their investigation and resolution
  - b. Description of any operational workarounds implemented
- 11. List of all SSGS database problems encountered and
  - a. Current status of their investigation and resolution
  - b. Description of any operational workarounds implemented









| DATA     | ITEM DESCRIPTION                                   | 2. NUMBER | OPS-3.6.3-02 |
|----------|--|-----------|--------------|
| 1. TITLE | Spacecraft Launch and Orbit Raising Data<br>Review | 3. DATE   | 8/26/97      |

Provide detailed description of spacecraft performance during the Launch Operations Review (LOR) phase. This review is conducted at L+2 months to allow contractor time to gather, analyze, and prepare data for presentation.

## 5. DATA REQUIREMENTS

The spacecraft contractor shall provide the following information in this review:

- 1. Data review (in the form of data plots/tables) of the results of operational performance identified during the HSC LOR and bus checkout.
- 2. Data review (in the form of data plots/tables) of diurnal signatures for key components (controls, power, thermal)
- 3. Data review (in the form of data plots/tables) for all anomalies and unexpected behavior encountered by the spacecraft contractor during LOR and bus checkout, including:
  - a. Data showing the anomalous or unexpected behavior
  - b. Descriptions of any workarounds and/or fixes
  - c. Data illustrating respose to the workarounds and/or fixes
- 4. Current status of all anomalies, ground system problems, and database problems encountered by the spacecraft contractor during LOR and bus checkout
- 5. Updates to all information presented at the Spacecraft Engineering Handover Review



CCR 4226C MOD 49





| DATA I   | TEM DESCRIPTION   | 2. NUMBER | OPS-3.6.4-01 |
|----------|---|-----------|--------------|
| 1. TITLE | Database Update and Delivery Process Training Documentation | 3. DATE   | 4/21/03      |

The spacecraft contractor shall develop a database training package that shall be used to train the mission operations personnel in the database update and delivery process.

# 5. DATA REQUIREMENTS

The database training package shall include training documentation on the following:

- Description of the GOES SSED ICD
- Description of the GOES unique SSED schema
- Description of the GOES Database ingestion toolset
- Detailed procedures for Flatfile generation, Oracle ingest, LIS file production, GSA file production DLRV file production, Command Pacing File production, validation process and CM process.
- Description of Sybase process for BSE updates



# 6. SPECIAL PREPARATION INSTRUCTIONS

(Mod97, CCR4364B)



| DATA I   | TEM DESCRIPTION                                | 2. NUMBER | OPS-3.6.4-02 |
|----------|--|-----------|--------------|
| 1. TITLE | Console Manual and PROC Training Documentation | 3. DATE   | 4/21/03      |

The spacecraft contractor shall develop a training package for the use of the GOES LOR Console Manuals and automated procedures (PROCs).

## 5. DATA REQUIREMENTS

The training shall include a general overview/walkthrough of the LOR Console Manual and PROC structure as well as a process description of where to obtain configuration managed LOR flight operations product files (including upload files, telemetry pages and plots), and how to modify those files for future spacecraft. The training package shall address the LOR SOE (Sequence of Events) (e.g., first pass, stellar acquisition) to detail how the console manuals and PROCs interact with the ground system.



# 6. SPECIAL PREPARATION INSTRUCTIONS

(Mod97, CCR4364B)



| DATA I   | TEM DESCRIPTION                 | 2. NUMBER | OPS-3.6.4-03 |
|----------|---------------------------------|-----------|--------------|
| 1. TITLE | ETE Test Training Documentation | 3. DATE   | 4/21/03      |

The spacecraft contractor shall develop an ETE test training package that will describe how to set up for and execute an end to end test between the spacecraft contractors integration and test facility and the SOCC.

## 5. DATA REQUIREMENTS

The ETE training package shall include test descriptions that will prepare the mission operations and I&T personnel for the execution of the Post Storage ETE and ETE # 5 tests. The training shall document the following:

- El Segundo Portable Telemetry Processor (PTP) set up and use
- El Segundo / SOCC / CCAFS Network description
- Spacecraft configuration in the High-Bay
- STE setup and configuration
- Description of ETE Test and functionality
- Description of Test Software and Execution

# 6. SPECIAL PREPARATION INSTRUCTIONS

(Mod97, CCR4364B)



| DATA I   | TEM DESCRIPTION | 2. NUMBER | PA-3.7.1-01 |
|----------|-----------------|-----------|-------------|
| 1. TITLE | Not Assigned    | 3. DATE   |             |

| 4. DESCRIPTION/PURPOS | SE |
|-----------------------|----|
|-----------------------|----|

5. DATA REQUIREMENTS



| DATA     | ITEM DESCRIPTION                                  | 2. NUMBER | PA-3.7.1-02 |
|----------|---|-----------|-------------|
| 1. TITLE | Previously Qualified Hardware and Software Report | 3. DATE   | 8/26/97     |

Identify all tasks which the Offeror proposes to eliminate on this program based on the use of previously qualified hardware and/or software for the GOES N-Q spacecraft program. Provide the justification for making the proposal for each task elimination.

#### 5. DATA REQUIREMENTS

For each previously qualified hardware design/configuration or software module/program which the Offeror proposes to use for the GOES N-Q spacecraft program and for which the Offeror proposes to eliminate specific tasks (e.g., specific tests, specific CDRL item, or specific deliverable) based on the proposed hardware or software being qualified due to previous design, testing, or performance history, the Offeror must demonstrate that the hardware or software has previously demonstrated the capability of meeting the GOES N-Q spacecraft mission, lifetime, performance, and Mission Assurance (MA) requirements. The demonstration should be performed at the highest integrated hardware or software level for which heritage can be proven: spacecraft, system, subsystem or component; software program or module.

The Offeror shall provide the following information for each previously qualified hardware design/configuration or software module/program proposed for the elimination of at least one specific task:

- 1. A listing of all specific tasks which the Offeror proposes to eliminate for the previously qualified hardware design/configuration or software module/program.
- 2. A comparison of each performance design, environmental, and interface requirement, including margins for this program (as delineated in the RFP documentation) with the corresponding requirement for the previous procurement for which the hardware design/configuration or software module/program was qualified. For any mission requirement or environmental difference (including lifetime, radiation, redundancy, ESD, and launch vibration) from the previous program, the Offeror will either describe the modifications which will be made to the hardware or software to meet GOES N-Q spacecraft requirements or provide a rationale and supporting information demonstrating why use without modification is considered acceptable for each of the specific tasks which the Offeror proposes to eliminate.
- 3. Compare the MA program proposed for this program to the MA program used previously for the hardware design/configuration or software module/program. Identify all waivers and deviations granted from the MA requirements of the program previously used for the





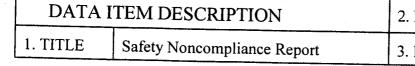
| DATA I   | TEM DESCRIPTION  | 2. NUMBER | PA-3.7.1-02 |
|----------|--|-----------|-------------|
| 1. TITLE | Previously Qualified Hardware and Software Report (Cont) | 3. DATE   | 8/26/97     |

qualified hardware or software. For any differences between the proposed MA program and the previously used program or for any previously granted deviations or waivers, describe what will be done for this program to achieve compliance or provide a rationale and supporting information demonstrating why the difference is acceptable. Indicate how any modifications proposed as a result of "1" above will be shown to comply with the MA program proposed for this program.

- 4. Compare the manufacturing information for the hardware design/configuration proposed for the GOES N-Q spacecraft with that of the previously qualified hardware. This will include, as a minimum, the name and location of the manufacturer, the date of manufacture, any design changes, any changes to parts or materials, any modifications to packaging techniques, and any changes to fabrication or assembly controls or processes.
- 5. Describe all flight experience with the proposed hardware design/configuration or software module/program including a description of all failures or anomalies, their cause, and any corrective action that was taken as a result. Additionally, describe all ground experience with the hardware or software related to failures that were determined to be "Could Not Duplicate" occurrences. Explain any "residual risks" which were noted to program, MA, mission and/or launch officials at the time of launch for that hardware or software. Include specific information on how successfully the hardware or software met its required/specified lifetime, performance, and mission criteria. If lifetime, performance, and/or mission criteria were not met, fully explain which criteria were not met and why.







2. NUMBER PA-3.7.1-03
3. DATE 8/26/97

### 4. DESCRIPTION/PURPOSE

This Safety Noncompliance Report (SNR) summarizes the results of analysis, test, and tradeoff studies as they relate to a request for waiver/deviation. It will identify the risk assessment, mishap potential, and justification associated with results of each waiver or deviation request received throughout the system life cycle.

# 5. DATA REQUIREMENTS

### Contents:

The SNR shall include the following information:

- a. A statement of the specific safety requirement and its associated source document name and paragraph number, as applicable, for which a waiver or deviation is being requested.
- b. A detailed technical justification for the exception.
- c. Analyses to show that the mishap potential of the proposed alternate requirement, method or process, as compared to the specific requirement.
- d. A narrative assessment of the risk involved in accepting the waiver or deviation. When it is determined that there are no hazards, the basis for such determination should be provided.
- e. A narrative on possible ways of reducing hazards severity and probability and existing compliance activities (if any).
- f. Starting and expiration date for waiver/deviation.







| DATA     | A ITEM DESCRIPTION         | 2. NUMBER | PA-3.7.1-04 |
|----------|----------------------------|-----------|-------------|
| 1. TITLE | System Safety Program Plan | 3. DATE   | 8/26/97     |

This plan details the tasks and activities of system safety management and system safety engineering required to identify, evaluate, and eliminate or control hazards throughout the spacecraft build and launch.

## 5. DATA REQUIREMENTS

## Content Requirements.

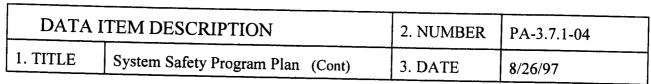
1. System Safety Organization. The plan shall include:

- a. The system safety organization or function within the organization of the total program using charts to show the organizational and functional relationships, and lines of communication.
- b. The responsibility, authority, and accountability of system safety personnel, other contractor organizational elements involved in the system safety effort, subcontractors, and system safety groups. The organizational unit responsible for executing each task. The position with the authority to resolve all identified hazards. The name, address, and telephone number of the System Safety Program Manager.
- c. The staffing of the system safety organization for the duration of the contract to include manpower loading and the qualifications of assigned key personnel.
- d. A description of the procedures which will be used to integrate and coordinate the system safety efforts including dissemination of the system safety requirements to action organizations and subcontractors, coordination of subcontractor's system safety programs, integration of hazard analyses, program and design reviews, program status reporting, and system safety groups.
- e. The process through which management decisions will be made to include notification of critical and catastrophic hazards, corrective action taken, mishaps or malfunctions, waivers to safety requirements, and program deviations.

# 2. <u>System Safety Program Milestone</u>: The plan shall include:

- a. The schedule when safety milestones will be achieved.
- b. A program schedule of safety tasks showing start and completion dates, reports, reviews, and man loading, in relationship to other program milestones.
- c. Integrated system activities (i.e., design analyses, tests, and demonstrations) applicable to the system safety program but specified in other engineering studies to preclude duplication. Estimated manpower loading required for these activities.





3. System Safety Requirements: This plan shall include:

a. A description of the methods that will be used to identify and apply safety/hazard control requirements and criteria for design of equipment, software and facilities, and for procedures, for all phases of acquisition specified by the contract SOW. A list of the sources of safety requirements (e.g. standards and system specifications) which are required for compliance and any others intended to be used.

b. The risk assessment procedures. State any qualitative or quantitative measures of system safety which is required to be met, including a description of the acceptable risk level. The system safety precedence to be followed in satisfying safety requirements shall be in accordance with MIL-STD-882C, paragraph 4.4. Include system safety definitions which are in addition to, or modifications of, those in MIL-STD-882C.

c. The management controls that shall be used to ensure compliance or justify waivers/deviations with general design and operational safety criteria, and the closed-loop procedures to ensure hazard resolution.

4. <u>Hazard Analyses:</u> Include a description of each hazard analysis to be conducted in a separate subsection. The plan shall include a description of:

a. The analysis technique and format that will be used in qualitative and quantitative analysis to identify hazards, their causes and effects, and recommended corrective action.

b. The depth within the system to which each analysis technique will be used including hazard identification associated with the system, subsystem, components, software, personnel, ground support equipment, government furnished equipment, facilities, and their interrelationship in the logistic support, training, maintenance, transportability, security, and operational environments.

c. The integration of subcontractor hazard analyses and techniques with overall system hazard analyses.

5. System Safety Data: The plan shall include:

a. A description of the approach for identifying, obtaining, researching, disseminating, and analyzing pertinent historical hazard or mishap data.

b. An identification of deliverable data by attaching a copy of the appropriate sheets of the CDRL.

c. An identification of safety related non-deliverable data and an identification of the procedures for accessibility by the managing activity and retention of data of historical value.

6. Safety Verification: The plan shall include:

- a. The verification requirements for ensuring that safety is adequately demonstrated.
- b. The procedures for ensuring feedback of test information for review and analysis.
- c. The review procedures established by the system safety organization to ensure safe conduct of all tests.







| DATA I   | TEM DESCRIPTION                   | 2. NUMBER | PA-3.7.1-04 |
|----------|-----------------------------------|-----------|-------------|
| 1. TITLE | System Safety Program Plan (Cont) | 3. DATE   | 8/26/97     |

6. Safety Verification (Cont): The plan shall include:

- d. The procedures for ensuring that all detected hazards have been eliminated or controlled to an acceptable level of risk.
- 7. <u>Training</u>. Include techniques and procedures to be used to ensure that the objectives and requirements of the system safety program are met in the safety training for engineers, technicians, programmers, and testing, operating and maintenance personnel.
- 8. <u>Audit Program.</u> The plan shall include the techniques and procedures to be employed to ensure that the objectives and requirements of the system safety program are being accomplished.
- 9. <u>Mishap Reporting and Investigation</u>. The plan shall include a description of the mishap and hazardous malfunction analysis process including alerting the Managing Activity.
- 10. <u>System Safety Interfaces</u>: The plan shall include, as addendums, the interface between system safety and:
  - a. All other applicable safety disciplines, such as Nuclear Safety, Range Safety, Explosive and Ordnance Safety, Chemical and Biological Safety, Occupational Safety and Health, Laser Safety, Software Safety, etc.
  - b. All other support disciplines, such as Maintainability, Quality Assurance, Security, Reliability, Human Factors Engineering, Transportability Engineering, Medical Support (Health Hazard Assessments), etc.





| DATA I   | TEM DESCRIPTION            | 2. NUMBER | PA-3.7.1-05 |  |
|----------|----------------------------|-----------|-------------|--|
| 1. TITLE | Operations Hazard Analysis | 3. DATE   | 8/26/97     |  |

The operations hazard analysis (OHA) shall consider safety requirements for personnel, procedures, and equipment used in the integration and test of GFE instruments, and subsequent storage and transportation of the spacecraft. An engineering design analysis shall be accomplished for review and for developing recommendations concerning system operations characteristics.

# 5. DATA REQUIREMENTS

#### Contents:

The OHA shall include the following information:

### 1.0 Introduction

- a. Provide an abstract summarizing the major findings of the analysis and the proposed corrective or follow-up actions.
- b. Define any special terms, acronyms, and/or abbreviations used.

# 2.0 System Description

- a. Provide a description of the system hardware and configuration. List components of subsystems.
- b. State the current design status of the project and provide the most recent schedules for production and testing of the spacecraft.
- c. Photographs, diagrams, and sketches should be included to support the test.

# 3.0 Analysis of System Hazards

- a. The analysis shall identify all real or potential hazards presented to personnel, equipment, and property during operation.
- b. A listing of all identified hazards shall be provided in a tabulated format. Each hazard shall be numbered and shall include the following information:
  - 1. System Component/Phase. The particular phase/component that the analysis is concerned with. This could be a system, subsystem, component, operating/maintenance procedure or environmental condition.
  - 2. System Description and Hazard Identification, Indication.
    - (a) A description of what is normally expected to occur as the result of operating the component/subsystem or performing the operating/maintenance action.
    - (b) A complete description of the actual or potential hazard resulting from normal actions or equipment failures. Indicate whether hazard will cause personnel injury and/or equipment damage.



| DATA I   | TEM DESCRIPTION                   | 2. NUMBER | PA-3.7.1-05 |
|----------|-----------------------------------|-----------|-------------|
| 1. TITLE | Operations Hazard Analysis (Cont) | 3. DATE   | 8/26/97     |

- (c) A description of crew indications which include all means of identifying the hazard to operating or maintenance personnel.
- (d) A complete description of the safety hazards of software controlling hardware systems where the hardware effects are safety critical.
- (3) <u>Effect on System.</u> The detrimental results an uncontrolled hazard could inflict on the whole system.
- (4) <u>Risk Assessment</u>. A risk assessment for each hazard as defined in paragraph 4.5 of MIL-STD-882C shall be provided.
- (5) Recommended Action and Effects.
  - (a) The recommended corrective action required to eliminate or control the hazard. Sufficient technical detail is required in order to permit the design engineers to adequately develop and assess design criteria resulting from the analysis.
  - (b) Discuss the effect of the recommended actions on the assigned risk assessment. Indicate any change to the hazard severity category and/or the probability of occurrence as a result of the corrective actions. If the recommended actions will result in cost/schedule/performance penalties to the extent that the contractor requires GSFC approval prior to incorporation, then these considerations should be addressed.
- (6) <u>Caution and Warning Notes</u>. A complete list of specific warnings, cautions, procedures required in operating and maintenance manuals, training courses, and test plans.
- (7) Status/Remarks.
  - (a) The status of actions to implement the recommended, or other, hazard controls.
  - (b) Any information relating to the hazard, not covered in the other blocks, for example, applicable documents, previous failure data in similar systems, or administrative directions.

#### 4.0 References.

List all pertinent references such as test reports, preliminary operating and maintenance manuals, and other hazard analysis.

### 5.0 Appendices,

The appendix will contain charts, graphs, or data which are too cumbersome for inclusion in the previous sections, or are applicable to more than one section. It may also contain detailed formulation or analysis which is more conveniently placed in an appendix.



| DATA I   | TEM DESCRIPTION  | 2. NUMBER | LV-3.8-01 |  |
|----------|--|-----------|-----------|--|
| 1. TITLE | Spacecraft/Launch Vehicle Interface Control Document (ICD) | 3. DATE   | 8/26/97   |  |

The spacecraft to launch vehicle interface control document (S/L ICD) is designed to provide the Spacecraft requirements definition, interface details, launch site facilities, and safety data between the launch vehicle and the spacecraft. It defines the mission requirements and interfaces as they are known. It shall also include any other contractor furnished hardware and services required such as transportation, propellants or analytical support services. The S/L ICD will evolve as mission requirements are identified.

CCR 4353C Mod85

## 5. DATA REQUIREMENTS

Spacecraft to Launch Vehicle ICD Format

Following is a sample S/L ICD format of appropriate detail. An S/L ICD format of similar detail shall be provided by the spacecraft Contractor.



## S/L ICD

Approvals and Distribution Page

- 1. Introduction
  - 1.1 Mission Information
  - 1.2 Purpose
  - 1.3 Launch Vehicle Description
    - 1.3.1 Configuration
    - 1.3.2 Non-Standard Service Hardware
  - 1.4 Spacecraft Description
  - 1.5 Definitions, Abbreviations/Acronyms
- 2. Applicable and Reference Documents
- 3. Mission Characteristics
  - 3.1 Launch Site
  - 3.2 Launch Vehicle Performance
  - 3.3 Mission Design Requirements
    - 3.3.1 Orbital Parameters
    - 3.3.2 Spacecraft Separation
      - 3.3.2.1 Orientation
      - 3.3.2.2 Translational and Rotational Rates
    - 3.3.3 Collision/Contamination Avoidance Maneuver



| DATA ITEM DESCRIPTION |   | 2. NUMBER | LV-3.8-01 |
|-----------------------|---|-----------|-----------|
| 1. TITLE              | Spacecraft/Launch Vehicle Interface Control Document (ICD) (Cont) | 3. DATE   | 8/26/97   |

- 3.4 Launch window
  - 3.4.1 Eclipse Constraints
  - 3.4.2 Sun Angle Constraints
  - 3.4.3 Ascending Node Constraints
- 3.5 Mission Time line
- 3.6 Launch Date
- 3.7 Spacecraft Systems Launch Configuration
- 3.8 Spacecraft Mass and Dynamic Properties
  - 3.8.1 Launch Mass
  - 3.8.2 Reference Coordinates/Drawing
  - 3.8.3 Center of Mass Location and Alignment
  - 3.8.4 Moments of Inertia
  - 3.8.5 Fundamental Frequencies (Axial/Lateral)
  - 3.8.6 Time Constant and Energy Dissipation Sources
- 3.9 Spacecraft Hazardous Systems
  - 3.9.1 Propulsion
  - 3.9.2 Electrical Explosive Devices (EEDs)
  - 3.9.3 Pressurized Systems
  - 3.9.4 Hazardous Fluids/Materials
  - 3.9.5 RF Systems
  - 3.9.6 Other

#### 4. Spacecraft Interfaces

- 4.1 Mechanical Interface
  - 4.1.1 Spacecraft Attach Fitting
  - 4.1.2 Spacecraft Dynamic or Static Envelope
    - 4.1.2.1 Envelope Incursions
    - 4.1.2.2 Compatibility Drawing
  - 4.1.3 Separation System
  - 4.1.4 Fairing
    - 4.1.4.1 Access
    - 4.1.4.2 Thermal Insulation
    - 4.1.4.3 Acoustic Blankets
  - 4.1.5 Spacecraft Integration
- 4.2 Electrical Interface
  - 4.2.1 Spacecraft Telemetry
    - 4.2.1.1 Stations
    - 4.2.1.2 Airborne Telemetry Support
    - 4.2.1.3 Data Rate/Type





| DATA IT  | TEM DESCRIPTION   | 2. NUMBER | LV-3.8-01 |
|----------|---|-----------|-----------|
| 1. TITLE | Spacecraft/Launch Vehicle Interface Control Document (ICD) (Cont) | 3. DATE   | 8/26/97   |

- 4.2.1.4 Special Hardware
  - 4.2.1.4.1 RF Window/Door
  - 4.2.1.4.2 Re-radiator
  - 4.2.1.4.3 Other
- 4.2.2 Launch Vehicle Provided Electrical Firing Pulses
- 4.2.3 Launch Vehicle Provided Discrete Commands
- 4.2.4 Vehicle Interface Connectors/Pin Assignments
  - 4.2.4.1 Launch Vehicle Interface Connectors
  - 4.2.4.2 Spacecraft Interface Connectors
  - 4.2.4.3 Pin Assignments
- 4.2.5 Separation Switches/Pads
- 4.2.6 Mission Peculiar Vehicle Telemetry
  - 4.2.6.1 Stations
  - 4.2.6.2 Airborne Telemetry Support
  - 4.2.6.3 Data Rate/Type
  - 4.2.6.4 Special Instrumentation
- 4.2.7 Special Vehicle Electrical Hardware
- 4.3 Environmental Interface
  - 4.3.1 Steady State Acceleration
  - 4.3.2 Structural Loads
  - 4.3.3 Vibration
    - 4.3.3.1 Random Vibration
    - 4.3.3.2 Sine Vibration
    - 4.3.3.3 Acoustic Environment
  - 4.3.4 Separation Shock
  - 4.3.5 Thermal and Humidity
    - 4.3.5.1 Fairing Temperature and Emissivity
    - 4.3.5.2 Free Molecular Heating Rate
    - 4.3.5.3 Spacecraft/PAF Thermal Interface
  - 4.3.6 Contamination Control
  - 4.3.7 Pressure
  - 4.3.8 Electromagnetic Compatibility
    - 4.3.8.1 General Requirements
    - 4.3.8.2 Launch Vehicle RF Environment
    - 4.3.8.3 Spacecraft EMI/RFI Environment

| DATA     | ITEM DESCRIPTION  | 2. NUMBER | LV-3.8-01 |
|----------|---|-----------|-----------|
| 1. TITLE | Spacecraft/Launch Vehicle Interface Control Document (ICD) (Cont) | 3. DATE   | 8/26/97   |

- 5. Ground Handling and Processing Requirements
  - 5.1 Facilities
    - 5.1.1 Operational Areas and Office Support Equipment
    - 5.1.2 Hazardous Processing Areas
    - 5.1.3 Block House
    - 5.1.4 Launch Pad
    - 5.1.5 Communications Requirements
    - 5.1.6 Power Requirements
    - 5.1.7 Spacecraft Handling/Test Equipment
    - 5.1.8 Special Equipment
  - 5.2 Logistics
    - 5.2.1 Transportation
    - 5.2.2 Handling
    - 5.2.3 Storage
  - 5.3 Facilities Environmental Interface
    - 5.3.1 Thermal
    - 5.3.2 Humidity
    - 5.3.3 Contamination Control
    - 5.3.4 Electromagnetic Compatibility
    - 5.3.5 Fairing Airflow
      - 5.3.5.1 Flow Rate
      - 5.3.5.2 Diffuser/Deflector
- 6. Mission Specific Launch Vehicle Modifications
  - 6.1 Launch Vehicle Configuration
  - 6.2 Special Vehicle Insignia
- 7. Safety and Security Services
- 8. Interface Verification/Compatibility Testing
  - 8.1 Analysis
    - 8.1.1 Mission Analysis
    - 8.1.2 SC Separation Analysis
    - 8.1.3 Collision/ Contamination Avoidance Maneuver (C/CAM) Analysis
    - 8.1.4 Coupled Loads Analysis
    - 8.1.5 Integrated Thermal Analysis
    - 8.1.6 EMI/EMC and RF Compatibility Analysis
    - 8.1.7 Acoustic Analysis
    - 8.1.8 Ascent Venting Analysis
    - 8.1.9 RF Link Analysis
    - 8.1.10 Critical Clearance Analysis



| DATA I   | TEM DESCRIPTION   | 2. NUMBER | LV-3.8-01 |
|----------|---|-----------|-----------|
| 1. TITLE | Spacecraft/Launch Vehicle Interface Control Document (ICD) (Cont) | 3. DATE   | 8/26/97   |

- 8.1.11 Separation System Stress Analysis
- 8.1.12 Post Launch Evaluation Report
- 8.2 Testing
  - 8.2.1 Separation Shock Testing
  - 8.2.2 Payload Attach Assembly Fit Check
  - 8.2.3 Launch Site End-to-End Tests
  - 8.2.4 SC/LV Buildup Interface Verification Tests
  - 8.2.5 Combined Electrical Readiness Test (CERT)
  - 8.2.6 SC/LV Launch Rehearsals
- 9.0 Verification Matrix

CCR4353C Mod85



| DATA IT  | EM DESCRIPTION                            | 2. NUMBER | LV-3.8-02 |
|----------|---|-----------|-----------|
| 1. TITLE | Preliminary Mission Analysis (PMA) Report | 3. DATE   | 8/26/97   |

The PMA provides the best available mission specific analysis of the launch vehicle performance given the latest spacecraft characteristics, orbit requirements, spin rate requirements, tracking requirements, etc. while using the latest vehicle characteristics. The Contractor shall use their standard mission analysis process to develop data for the Preliminary Mission Analysis (PMA), a three-degree-of-freedom simulation. The Contractor shall consider GOES O SC and GOES P SC a duplicate of GOES N and may submit, for Government concurrence, applicable GOES N analysis, with justification, for GOES O and P assuming there are no significant changes to the SC, ground support equipment (GSE), and LV. However, if form, fit, function, component, vendor, method of assembly, and/or integration and test approach are modified or changed, then the affected GOES O or GOES P analysis shall be performed.

CCR 4353C Mod85

## 5. DATA REQUIREMENTS



The delivery of the PMA and the closure of any action items generated within 30 days after receipt of the PMA is the basis for accepting the PMA.

This analysis is the first step in the mission planning process. It uses best available mission requirements (spacecraft weight, orbit requirements, tracking requirements, etc.) and is primarily intended to uncover and resolve any unusual problems inherent in accomplishing the mission objectives. Specifically, the PMA results include at a minimum: the nominal and 3-sigma limits for the orbit elements (altitude, latitude, longitude, inertial velocity, flight path angle, azimuth angle, semi-major axis, apogee, perigee, eccentricity, inclination, argument of perigee, and nodal right ascension), spacecraft attitude, spacecraft translational and rotational rates at separation. The contractor shall perform and document trade studies as required to resolve any launch window sensitivities issues with sun angle and eclipse times over the planned launch window, and any changes in the trajectory design parameters required to achieve the launch window including weather and range safety. The contractor shall provide a separation distance history for a period of one orbit, including description of any collision/contamination avoidance maneuver required; definition of nominal spent stage and fairing impact points and predicted dispersions. Sequence of events, and tracking coverage shall also be performed. Specific analysis is required for overall performance, mass properties, trajectory, and guidance requirements. The orbit dispersion data shall be presented in the form of variations of the critical orbit parameters as functions of probability level. A covariance matrix, mass history, and a trajectory printout should also be included.

CCR 4353C Mod85





| DATA IT  | EM DESCRIPTION                            | 2. NUMBER | LV-3.8-02 |
|----------|---|-----------|-----------|
| 1. TITLE | Preliminary Mission Analysis (PMA) Report | 3. DATE   | 8/26/97   |





| DATA I   | TEM DESCRIPTION                     | 2. NUMBER | LV-3.8-03 |
|----------|-------------------------------------|-----------|-----------|
| 1. TITLE | Final Mission Analysis (FMA) Report | 3. DATE   | 8/26/97   |

The FMA provides a review of the Preliminary Mission Analysis using updates of the spacecraft characteristics, orbit requirements, spin rate requirements, tracking requirements, and the latest launch vehicle characteristics. The FMA provides the final analysis of the launch vehicles capability to successfully accomplish the spacecraft requirements. The Contractor shall use their standard mission analysis process to develop data for the Final Mission Analysis (FMA), a three-degree-of-freedom simulation. The Contractor shall consider GOES O SC and GOES P SC a duplicate of GOES N and may submit, for Government concurrence, applicable GOES N analysis, with justification, for GOES O and P assuming there are no significant changes to the SC, ground support equipment (GSE), and LV. However, if form, fit, function, component, vendor, method of assembly, and/or integration and test approach are modified or changed, then the affected GOES O or GOES P analysis shall be performed.

CCR 4353C Mod85



### 5. DATA REQUIREMENTS

The delivery of the FMA and the closure of any action items generated within 30 days after receipt of the FMA is the basis for accepting the FMA.

The FMA presents the three-degree-of-freedom trajectory simulation of the mission from lift-off through spacecraft separation and includes any collision/contamination avoidance maneuvers. This analysis is prepared based on spacecraft requirements resulting from review by the contractor and GOES Project of the PMA and contains the same information as the PMA. The error data may be omitted if there is no change in the orbit requirements or mass properties.

CCR 4353C Mod85



| DATA I   | TEM DESCRIPTION  | 2. NUMBER | LV-3.8-04 |
|----------|--|-----------|-----------|
| 1. TITLE | Booster on Stand or Pre-Vehicle on Stand (Pre-VOS) Review Data Package | 3. DATE   | 8/26/97   |

CCR 4353C Mod85

## 4. DESCRIPTION/PURPOSE

Provide mission level review to demonstrate all launch operations are satisfied prior to launch vehicle erection

## 5. DATA REQUIREMENTS

The contractor data package shall document the coordination and integration of all launch site and range activities required, to support launch vehicle erection.

CCR 4353C Mod85





| DATA I   | TEM DESCRIPTION                                  | 2. NUMBER | LV-3.8-05 |
|----------|--|-----------|-----------|
| 1. TITLE | Launch Vehicle Design Certification Review (DCR) | 3. DATE   | 8/26/97   |

The LVDCR shall occur after all qualification testing is complete, exclusive of launch site processing, in support of any change to the launch vehicle in accordance with SOW Section 1.1. The LVDCR demonstrates that the configuration or item under design review meets the requirements of the LV-SC ICD.

#### 5. DATA REQUIREMENTS

The Launch Vehicle Design Certification Review (LVDCR) provides for the review of changes in accordance with SOW Section 1.1, to flight hardware and/or software, and ground hardware and/or software. The contractor shall present the design of the launch vehicle systems in sufficient detail to demonstrate that ICD requirements are met, the contractor's methodology for ensuring compliance (analysis, test, verification) and how launch vehicle systems will perform at the same level or provide improved performance.



A launch vehicle DCR will only be required for those major systems that have changed since the last launch vehicle mission prior to a GOES mission. Component changes or first flight items will be covered by the Pre-VOS review (CDRL LV-3.8-04)

CCR 4353C Mod85

NASA shall be invited to all subsequent Pre-VOS reviews to obtain insight to the launch vehicle system modifications.





| DATA ITE | M DESCRIPTION   | 2. NUMBER | LV-3.8-06 |
|----------|---|-----------|-----------|
| 1. TITLE | Spacecraft/Launch Vehicle Interface Requirements Document (IRD) (Performed for DIII but not required for DIV) | 3. DATE   | 8/26/97   |

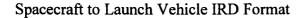
CCR 4353C Mod85

#### 4. DESCRIPTION/PURPOSE

The spacecraft to launch vehicle interface requirements document (IRD) is designed to provide the spacecraft requirements definition, interface details, launch site facilities, and safety data necessary to interface with the launch vehicle. It defines the mission requirements and interfaces as they are known. If shall also include any other government furnished hardware and services required such as transportation, propellants or analytical support services. The IRD shall evolve as mission requirements are identified.

#### 5. DATA REQUIREMENTS

The spacecraft to launch vehicle IRD shall document all mission-peculiar requirements. The IRD is prepared by the Spacecraft Contractor. The initial issue of the IRD shall be delivered as a part of the contractors proposal. The IRD is provided to the GOES project for review and approval. The IRD shall be revised as required, with a delivery at the Spacecraft Preliminary Design Review and a final delivery at the Spacecraft Critical Design Review. Each revision shall be approved by the GOES project.



Following is a sample IRD format of appropriate detail. An IRD format of similar detail shall be provided by the spacecraft Contractor.

#### **IRD**

Approvals and Distribution Page

- 1. Introduction
  - 1.1 Mission Information
  - 1.2 Purpose
  - 1.3 Launch Vehicle Description
    - 1.3.1 Configuration
    - 1.3.2 Non-Standard Service Hardware
  - 1.4 Spacecraft Description
  - 1.5 Definitions, Abbreviations/Acronyms
- 2. Applicable and Reference Documents
- 3. Mission Characteristics
  - 3.1 Launch Site
  - 3.2 Launch Vehicle Performance
  - 3.3 Mission Design Requirements





| DATA     | ITEM DESCRIPTION   | 2. NUMBER | LV-3.8-06 |
|----------|--|-----------|-----------|
| 1. TITLE | Spacecraft/Launch Vehicle Interface Requirements Document (IRD) (Performed for DIII but not required for DIV) (Cont) | 3. DATE   | 8/26/97   |

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|   |   |     |                                  | ┖             | "  | U1 | LC  | LI | 1 0 | 110 |     |   |   |   |

- 3.3.2 Spacecraft Separation
  - 3.3.2.1 Orientation
  - 3.3.2.2 Translational and Rotational Rates
- 3.3.3 Collision/Contamination Avoidance Maneuver

#### 3.4 Launch Window

- 3.4.1 Eclipse Constraints
- 3.4.2 Sun Angle Constraints
- 3.4.3 Ascending Node Constraint
- 3.5 Mission Time line
- 3.6 Launch Date
- 3.7 Spacecraft Systems Launch Configuration
- 3.8 Spacecraft Mass and Dynamic Properties
  - 3.8.1 Launch Mass
  - 3.8.2 Reference Coordinates/Drawing
  - 3.8.3 Center of Mass Location and Alignment
  - 3.8.4 Moments of Inertia
  - 3.8.5 Fundamental Frequencies (Axial/Lateral)
  - 3.8.6 Time Constant and Energy Dissipation Sources

## 3.9 Spacecraft Hazardous Systems

- 3.9.1 Propulsion
- 3.9.2 Electrical Explosive Devices (EEDs)
- 3.9.3 Pressurized Systems
- 3.9.4 Hazardous Fluids/Materials
- 3.9.5 RF Systems
- 3.9.6 Other

#### 4 Spacecraft Interfaces

- 4.1 Mechanical Interface
  - 4.1.1 Spacecraft Attach Fitting
  - 4.1.2 Spacecraft Dynamic or Static Envelope
    - 4.1.2.1 Envelope Incursions
    - 4.1.2.2 Compatibility Drawing
  - 4.1.3 Separation System
  - 4.1.4 Fairing
    - 4.1.4.1 Access
    - 4.1.4.2 Thermal Insulation
    - 4.1.4.3 Acoustic Blankets





| DATA     | ITEM DESCRIPTION   | 2. NUMBER | LV-3.8-06 |
|----------|--|-----------|-----------|
| 1. TITLE | Spacecraft/Launch Vehicle Interface<br>Requirements Document (IRD) (Performed for<br>DIII but not required for DIV) (Cont) | 3. DATE   | 8/26/97   |

## 4.1.5 Spacecraft Integration

# 4.2 Electrical Interface

- 4.2.1 Spacecraft Telemetry
  - 4.2.1.1 Stations
  - 4.2.1.2 Airborne Telemetry Support
  - 4.2.1.3 Data Rate/Type
  - 4.2.1.4 Special Hardware
    - 4.2.1.4.1 RF Window/Door
    - 4.2.1.4.2 Re-radiator
    - 4.2.1.4.3 Other
- 4.2.2 Launch Vehicle Provided Electrical Firing Pulses
- 4.2.3 Launch Vehicle Provided Discrete Commands
- 4.2.4 Vehicle Interface Connectors/Pin Assignments
  - 4.2.4.1 Launch Vehicle Interface Connectors
  - 4.2.4.2 Spacecraft Interface Connectors
  - 4.2.4.3 Pin Assignments
- 4.2.5 Separation Switches/Pads
- 4.2.6 Mission Peculiar Vehicle Telemetry
  - 4.2.6.1 Stations
  - 4.2.6.2 Airborne Telemetry Support
  - 4.2.6.3 Data Rate/Type
  - 4.2.6.4 Special Instrumentation
- 4.2.7 Special Vehicle Electrical Hardware

#### 4.3 Environmental Interface

- 4.3.1 Steady State Acceleration
- 4.3.2 Structural Loads
- 4.3.3 Vibration
  - 4.3.3.1 Random Vibration
  - 4.3.3.2 Sine Vibration
  - 4.3.3.3 Acoustic Environment
- 4.3.4 Separation Shock
- 4.3.5 Thermal and Humidity
  - 4.3.5.1 Fairing Temperature and Emissivity
  - 4.3.5.2 Free Molecular Heating Rate
  - 4.3.5.3 Spacecraft/PAF Thermal Interface
- 4.3.6 Contamination Control
- 4.3.7 Pressure
- 4.3.8 Electromagnetic Compatibility
  - 4.3.8.1 General Requirements
  - 4.3.8.2 Launch Vehicle RF Environment

| DATA     | ITEM DESCRIPTION   | 2.<br>NUMBER | LV-3.8-06 |
|----------|--|--------------|-----------|
| 1. TITLE | Spacecraft/Launch Vehicle Interface Requirements Document (IRD) (Performed for DIII but not required for DIV) (Cont) | 3. DATE      | 8/26/97   |

#### 4.3.8.3 Spacecraft EMI/RFI Environment

- 5. Ground Handling and Processing Requirements
  - 5.1 Facilities
    - 5.1.1 Operational Areas and Office Support Equipment
    - 5.1.2 Hazardous Processing Areas
    - 5.1.3 Block House
    - 5.1.4 Launch Pad
    - 5.1.5 Communications Requirements
    - 5.1.6 Power Requirements
    - 5.1.7 Spacecraft Handling/Test Equipment
    - 5.1.8 Special Equipment
  - 5.2 Logistics
    - 5.2.1 Transportation
    - 5.2.2 Handling
    - 5.2.3 Storage
  - 5.3 Facilities Environmental Interface
    - 5.3.1 Thermal
    - 5.3.2 Humidity
    - 5.3.3 Contamination Control
    - 5.3.4 Electromagnetic Compatibility
    - 5.3.5 Fairing Airflow
      - 5.3.5.1 Flow Rate
      - 5.3.5.2 Diffuser/Deflector
- 6. Mission Specific Launch Vehicle Modifications
  - 6.1 Launch Vehicle Configuration
  - 6.2 Special Vehicle Insignia
- 7. Safety and Security Services
- 8. Interface Verification/Compatibility Testing
  - 8.1 Analysis
    - 8.1.1 Mission Analysis
    - 8.1.2 SC Separation Analysis
    - 8.1.3 Collision/ Contamination Avoidance Maneuver (C/CAM) Analysis
    - 8.1.4 Coupled Loads Analysis
    - 8.1.5 Integrated Thermal Analysis
    - 8.1.6 EMI/EMC and RF Compatibility Analysis
    - 8.1.7 Acoustic Analysis
    - 8.1.8 Ascent Venting Analysis
    - 8.1.9 RF Link Analysis
    - 8.1.10 Critical Clearance Analysis





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| DATA ITE | M DESCRIPTION  | 2. NUMBER | LV-3.8-06 |
|----------|--|-----------|-----------|
| 1. TITLE | Spacecraft/Launch Vehicle Interface<br>Requirements Document (IRD) (Performed<br>for DIII but not required for DIV) (Cont) | 3. DATE   | 8/26/97   |

- 8.1.11 Separation System Stress Analysis
- 8.1.12 Post Launch Evaluation Report
- 8.2 Testing
  - 8.2.1 Separation Shock Testing
  - 8.2.2 Payload Attach Assembly Fit Check
  - 8.2.3 Launch Site End-to-End Tests
  - 8.2.4 SC/LV Buildup Interface Verification Tests
  - 8.2.5 Combined Electrical Readiness Test (CERT)
  - 8.2.6 SC/LV Launch Rehearsals





| DATA I   | TEM DESCRIPTION  | 2. NUMBER | LV-3.8-07 |
|----------|--|-----------|-----------|
| 1. TITLE | Mission Integration Program Kickoff Review (Performed for DIII but not required for DIV) | 3. DATE   | 8/26/97   |

CCR 43530 Mod8

# 4. DESCRIPTION/PURPOSE

The Mission Integration Program Kickoff Review shall consist of a formal presentation from the launch vehicle contractor. This item shall also include a mission integration plan. NASA will utilize existing contractor documentation to the greatest extent possible. The plan shall describe how the launch services contractor will manage the integration of the spacecraft.

# 5. DATA REQUIREMENTS

The Mission Integration Program Kickoff Review shall include information describing the methodologies the contractor will use to manage the various mission unique services including design, development, qualification, testing, and integration. Details describing the mission unique analyses to be performed to verify compatibility of the spacecraft design with the interfaces and environments of the launch services. The mission integration management process shall be described and the interface working group structures established.





| DATA IT  | EM DESCRIPTION  | 2. NUMBER | LV-3.8-08 |
|----------|---|-----------|-----------|
| 1. TITLE | Launch Services System Effectiveness (LSSE)<br>Program Plan | 3. DATE   | 8/26/97   |

The LSSE describes the contractor's processes to ensure performance, integrity and conformity of all products provided by the contractor.

### 5. DATA REQUIREMENTS

The contractor shall develop/provide the LSSE to include, as a minimum, the items listed below. The LSSE shall be prepared in the contractor's format.

- a. Reliability
- b. Quality Assurance
- c. System Safety
- d. Inspection
- e. Electrical, Electronic, and Electro-mechanical (EEE) Parts Control
- f. Materials and Processes Control
- g. Contamination Control
- h. Hardware and Software Configuration Control
- i. Software Product Assurance
- j. Material Review Program
- k. Audits
- l. Corrective Action Closures





| DATA IT  | EM DESCRIPTION  | 2. NUMBER | LV-3.8-09 |
|----------|---|-----------|-----------|
| 1. TITLE | Launch Vehicle Requirements Review Data Package (Performed for DIII but not required for DIV) | 3. DATE   | 8/26/97   |

CCR 4353C Mod85

## 4. DESCRIPTION/PURPOSE

The Launch Vehicle Requirements Review is held to establish the general guidelines for reviewing mission requirements and implementing these requirements into the spacecraft/launch vehicle ICD.

# 5. DATA REQUIREMENTS

The launch vehicle requirements review data package should address the following minimum items:

- a. Spacecraft Requirements
- b. Launch Requirements
- c. Targeting Requirements
- d. Safety Requirements
- e. Mission Peculiar Requirements
- f. Ground Support Equipment Requirements
- g. Airborne Requirements
- h. Software Requirements
- i. Instrumentation and Data Requirements
- j. Test Plans and Procedures
- k. Verification and Validation Requirements
- l. Configuration Management Controls



| DATA ITEM DESCRIPTION |  | 2. NUMBER | LV-3.8-10 |
|-----------------------|--|-----------|-----------|
| 1. TITLE              | Delta IV Launch System Training Data Package | 3. DATE   | ·         |
|                       |  |           | 04/16/03  |

Provide a 5-day training class to facilitate NASA understanding of the basic Delta IV launch system.

#### CCR 4353C Mod85

## 5. DATA REQUIREMENTS

Provide functional level overview of the basic Delta IV Launch System including the design of the manufacturing facilities, launch facilities, launch vehicles, ground support equipments and transportation system. Discussion of hardware and software qualification and analysis will be provided through the DIV Certification and Independent Verification and Validation process.







| DATA ITEM DESCRIPTION 2. NUMBER LV-3 |   |         | LV-3.8-11 |
|--------------------------------------|---|---------|-----------|
| 1. TITLE                             | Mission Unique Design Review #1 Package | 3. DATE |           |
|                                      |   |         | 04/16/03  |

The Mission Unique Design Review #1 is held immediately prior to mission unique design freeze and before significant fabrication activity begins. The Mission Unique Design Review #1 presents the final design modifications when 90% of the drawings have been released. These designs are evaluated by preliminary analyses to show that the design will meet the final performance and design objectives and are compliant to the interface specifications requirements. The Mission Unique Design Review #1should represent a complete and comprehensive presentation of the entire design. It should present the final design and interfaces by means of block diagrams, power flow diagrams, interface circuits, layout drawings, software logic flow and timing diagrams, modeling results, and test results when performed for mission unique modifications. System engineering, resource allocations and design analyses are required to demonstrate compliance with requirements. Single-point failure modes need to be identified and assessed. Robustness of the selected design needs to be shown.

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Completion of the Mission Unique Design Review #1 and resolution of all action items generated by it constitutes the baseline design for the items to be built. Formal configuration control begins no later than the date of the Mission Unique Design Review #1.

# 5. DATA REQUIREMENTS

The Mission Unique Design Review #1 Package should address the following minimum items:

- a. Mission Particular Requirements General Specification and Product Reviews
- b. Performance Requirements
- c. Communication Systems, Data Rates, Telemetry List, Command List, EMI/EMC
- d. Spacecraft/Launch Vehicle Interface Requirements (e.g. PAF type, fairing mods, electrical connectors, special instrumentation)
- e. Mechanical/Structural Design and Supporting Preliminary Analyses
- f. Electrical (including grounding), Thermal, Acoustic Design and Supporting Preliminary Analyses
- g. Software Requirements and Design
- h. Ground Support Equipment Design
- i. Design Verification, Test Flow and Test Plans
- j. Ground System Operations (including launch day operations)
- k. Preliminary Contamination Requirements and Control Plan
- Safety, Quality Control, Reliability and Redundancy preliminary analyses associated with Mission Unique Modifications



| DATA I   | TEM DESCRIPTION                         | 2. NUMBER | LV-3.8-11 |
|----------|---|-----------|-----------|
| 1. TITLE | Mission Unique Design Review #1 Package | 3. DATE   |           |
|          |   |           | 04/16/03  |

# 5. DATA REQUIREMENTS (cont.)

- m. First Time Usage Materials and Processes
- n. Acronyms and Abbreviations
- o. Preliminary Mass Properties Report
- p. (deleted)
- q. Single Point Failure Modes of Mission Unique Modifications
- r. Evolution and Heritage of the Mission Unique Design

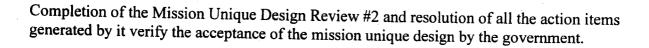






| DATA IT  | EM DESCRIPTION                          | 2. NUMBER | LV-3.8-12 |
|----------|---|-----------|-----------|
| 1. TITLE | Mission Unique Design Review #2 Package | 3. DATE   |           |
|          |   | ·         | 04/16/03  |

The Mission Unique Design Review #2 should be held after all final mission analyses have been completed. Final estimates of weight, power, and volume are to be presented. Final calculations for mechanical loads, stress, torque margins, and thermal performance are to be presented. Final software requirements and updated system performance estimates should also be presented. The Mission Unique Design Review #2 should include all of the items specified for a Mission Unique Design Review #1, updated to the final present stage of development process. Supporting data and analyses should be included to demonstrate compatibility by comparing GOES requirements to those of previous LV missions. A systems level analysis shall be performed which identifies the LV margins over the mission requirements for the electrical and hydraulic power, thermal control, propulsion and light control systems, LV consumables and battery lifetimes; information pertaining to vehicle environment (acoustics, shock, EMI/EMC, contamination); lift capability and margins and reserves; sequence; reliability assessment. Each vehicle system should identify the flight segment(s) with minimum margins and provide evidence that sufficient margins exist for mission success.



## 5. DATA REQUIREMENTS

The Mission Unique Design Review #2 Package should address the following minimum items.

- a. Evolution and Heritage of the Final Design (if changed from MUDR #1)
- b. Launch Vehicle Total System Performance
- c. Closure of Actions from MUDR #1
- d. Status of Interface Control Document Requirements Compliance
- e. Final Implementation Plans including: Engineering Models, Prototypes, Flight Units, and Spares
- f. Completed Design Analyses
- g. Qualification Test Plans
- h. Ground Operations
- k. System Safety
- 1. Problem Areas





| DATA IT  | EM DESCRIPTION                          | 2. NUMBER | LV-3.8-12 |
|----------|---|-----------|-----------|
| 1. TITLE | Mission Unique Design Review #2 Package | 3. DATE   | 04/16/03  |

| 5. | DATA | REQU | JIREMENTS | (cont.) | ) |
|----|------|------|-----------|---------|---|
|----|------|------|-----------|---------|---|

| m. | Updated Integration & Launch Operations Schedules | CCR   |
|----|---|-------|
|    | Open Items  | 4353C |
|    | •   | Mod85 |
| 0. | Power Profile Report (LV Battery Margin)          |       |







| DATA ITEM DESCRIPTION |   | 2. NUMBER | LV-3.8-13 |
|-----------------------|---|-----------|-----------|
| 1. TITLE              | Launch Vehicle Component and Subsystem Test<br>Procedures | 3. DATE   | 8/26/97   |

These documents will be used to review the qualification and acceptance test activity at the subsystem and component levels of manufacturing and assembly for new, modified, or first-flight components or systems. All other information will be available on an "as needed basis" and provided through the NASA Resident Office or Launch Vehicles.

## 5. DATA REQUIREMENTS

The Verification Test Procedures shall describe the implementation of the verification test plan requirements, and shall also describe the accept/reject criteria for the planned measurements.



| DATA ITEM DESCRIPTION |  | 2. NUMBER | LV-3.8-14 |
|-----------------------|--|-----------|-----------|
| 1. TITLE              | Launch Vehicle Component and Subsystem Test<br>Data Packages | 3. DATE   | 8/26/97   |

To document and review the results of each test activity for new, modified, or first-flight components or systems. All other information will be available on an "as needed basis" and provided through the NASA Resident Office for Launch Vehicles.

#### 5. DATA REQUIREMENTS

The contractor shall evaluate the data taken during command and subsystem testing for conformance with the applicable specification and programmatic requirements.

As a minimum, the data package shall contain:

- a. Test data
- b. Evidence of Quality Assurance acceptance data
- c. Listing of test requirements verified
- d. Summary description and commentary on the test data package
- e. Test procedures as run
- f. Test procedure change record listing
- g. Data trending
- h. Analysis used to demonstrate performance
- i. Configuration identification list
- j. Material review actions resulting from the tests
- k. Test equipment calibration data
- 1. Failure report listing and copies as required
- m. Operating time/cycle data
- n. Failure resolution



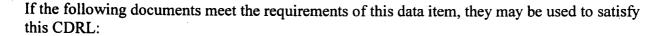


| DATA ITEM DESCRIPTION |   | 2. NUMBER | LV-3.8-15 |
|-----------------------|---|-----------|-----------|
| 1. TITLE              | Launch Vehicle Launch Site Integration Plan | 3. DATE   | 8/26/97   |

Provide documentation required to support launch operations. This document will be used as an input document for transmittal of all launch vehicle requirements to ER and is the primary document used by ER for the preparation of their Launch Site Support Plan (LSSP) and Payload Requirements Document (PRD).

## 5. DATA REQUIREMENTS

The Launch Vehicle Launch Site Integration Plan shall define and document all vehicle launch site activities necessary to deliver, assemble, test, checkout, erect and process the launch vehicle at the launch site. This plan shall include vehicle operations, spacecraft to launch vehicle integration, vehicle/spacecraft integrated testing, final systems testing and launch countdown operations. All operations at the launch site shall be described and demonstrate compliance with EWR 127-1 requirements. All safety documents shall be identified and described including contingency plans. Any constraints to vehicle ground or flight operations shall be identified. Other support services required shall be described and implementation plans defined.



- 1) Launch Campaign Operations Plan.
- 2) Test Requirements Document for GOES.
- 3) PPRD
- 4) PRD

## 6. SPECIAL PREPARATION INSTRUCTIONS

CCR 4353C Mod85





| DATA ITEM DESCRIPTION |   | 2. NUMBER | LV-3.8-16 |
|-----------------------|---|-----------|-----------|
| 1. TITLE              | Launch Vehicle Pre-Installation Reviews Data<br>Package | 3. DATE   | 8/26/97   |

The purpose of this review is to ensure that the design/pedigree integrity for major components (e.g. motors, guidance control unit) have been validated through environmental qualifications and/or acceptance test programs, and that all deviations, waivers and/or open items have been satisfactorily dispositioned. Launch vehicle MSK (major subcontractor) reviews can be used in lieu of the pre-installation reviews.

The following major elements will require pre-installation or MSK reviews: RS-68 Engine, and RL10B-2 Engine.

Satisfactory completion of the pre-installation and close-out of any actions items completes the pre-installation review process.

Major component data packages (tanks, EMA, etc.) will be available on an "as needed basis" and provided through the NASA Resident Office for Launch Vehicles.

# 5. DATA REQUIREMENTS

The Pre-Installation Review Data Package should address the following minimum items.

- a. Any rework/replacement of hardware, regression testing, or test plan changes should be highlighted during the test flow discussions
- b. Compliance with the test verification matrix
- c. Measured Test Margins versus Design Estimates
- d. Demonstrate Qualification/Acceptance Margins
- e. Any data which has been trended to identify compliance with specification should be presented, especially if there has been a change or drift to the trend.
- f. Total failure-free operating time of the item
- g. Could-Not-Duplicate failures should be presented along with assessment of the problem and the residual risk that may be inherent in the item
- h. Project assessment of any residual risk



| DATA ITEM DESCRIPTION |   | 2. NUMBER | LV-3.8-17 |
|-----------------------|---|-----------|-----------|
| 1. TITLE              | Final Loads Verification Review Data<br>Package | 3. DATE   | 8/26/97   |

To review, with the GOES Project, the final status of the spacecraft to launch vehicle coupled dynamic loads based upon the flight azimuth, launch environments, final spacecraft mass properties, etc.

The review shall be supported by the Launch Services Subcontractor.

CCR 4353C Mod85

### 5. DATA REQUIREMENTS

The contractor shall develop the format and contents of this review. Critical performance performed and provided in the Final Mission Analysis Report shall be included in this review.





| DATA IT  | EM DESCRIPTION                             | 2. NUMBER | LV-3.8-18 |
|----------|--|-----------|-----------|
| 1. TITLE | Launch Vehicle Launch Site Test Procedures | 3. DATE   | 8/26/97   |

Defines the procedures for assembly, test, checkout and launch support of the GOES Spacecraft at ER.

#### 5. DATA REQUIREMENTS

The contractor shall provide all required procedures (in the format acceptable to ER NASA) for test activities at ER. The procedures shall include, but are not limited to, the following areas:

- a. Launch Vehicle Power and Checkout
- b. Integrated Spacecraft Tests
- c. Launch Vehicle Testing with Ground Facilities
- d. Launch Vehicle Propellant Loading and Handling (e.g., Wet Dress Rehearsal)
- e. Emergency Contingency Operations
- f. Launch Vehicle Mating to Spacecraft
- g. Spacecraft/Launch Vehicle Checkout (e.g., Combined System Tests)
- h. GSE Checkout and Validation
- i. Ordnance Activities

#### 6. SPECIAL PREPARATION INSTRUCTIONS

The procedures shall specify all of the step-by-step procedures for the handling of the GOES Spacecraft by the launch services contractor. The procedure shall include the following:

- 1. Special environmental conditions, such as cleanliness, temperature, humidity, etc.
- 2. Requirements for special tools, equipment, special handling fixtures, cranes, etc.
- 3. Procedures to comply with EWR-127-1.

The spacecraft contractor shall deliver all the specified number of copies to the Delta IV CCAFS NASA Drop Box. A formal letter shall be provided to the contracting officer (at NASA/GSFC) to formally document the delivery and contract compliance.

CCR 4353C Mod85



CCR4343A, M Mod85



| DATA ITEM DESCRIPTION |                                     | 2. NUMBER | LV-3.8-19 |
|-----------------------|-------------------------------------|-----------|-----------|
| 1. TITLE              | Integrated Spacecraft Handling Plan | 3. DATE   | 8/26/97   |

Provide the plan for the handling of the spacecraft and ground support equipment during integration of the spacecraft with the launch vehicle.

#### 5. DATA REQUIREMENTS

The Handling Plan shall incorporate details of the processes to be used by the launch vehicle contractor in handling of the spacecraft and GSE during launch vehicle integration. Requirements for special handling procedures shall be specified. The plan shall include all necessary planning and paperwork to support the integration. These details shall include the following:

1. Lifting/handling GSE and personnel required.

2. Requirements for pertinent calibration, special tools, fixtures, crane operations, etc.

3. Identify pad operation restrictions, personnel loading, etc.

## (paragraph deleted)

#### 6. SPECIAL PREPARATION INSTRUCTIONS

CCR 4353C Mod85





| DATA ITEM DESCRIPTION |  | 2. NUMBER | LV-3.8-20 |
|-----------------------|--|-----------|-----------|
| 1. TITLE              | Launch Vehicle Pre-Shipment Review (PSR) Data<br>Package | 3. DATE   | 8/26/97   |

The PSR occurs prior to the shipment of the launch vehicle to the launch site. The purpose of the PSR is to assure the design of the launch vehicle has been validated through the environmental qualification and/or acceptance test program, that all deviations, waivers and open items have been satisfactorily dispositioned and that the launch vehicle, along with all the required documentation, operation procedures, etc., is ready for shipment and routine launch site processing. The results of system testing, calibration, and end item performance are to be demonstrated and documented. The solutions to all problems encountered during the environmental test and validation program and the solution rationale are to be presented. Post Production Hardware Reviews (PPHR) can be used in lieu of the pre-shipment reviews.

The following major elements will require pre-shipment reviews or PPHR: First Stage, Second Stage, Payload Attach Fitting, Payload Fairing, Graphite Epoxy Motors, and Redundant Inertial Flight Control Assembly.



Satisfactory completion of the pre-shipment and the close-out of any actions from the review indicate the item is ready for shipment.

### 5. DATA REQUIREMENTS

The PSR Data Package should address the following minimum items.

- a. Major element performance, discrepancies, failures, open items during fabrication and checkout.
- b. Project assessment of any residual risk
- c. Shipping Containers, Monitoring/Control Plans and Mode of Transportation
- d. Ground Support Equipment Status
- e. Post Shipment Plans
- f. Launch Preparation Plan

## 6. SPECIAL PREPARATION INSTRUCTIONS





| DATA I   | TEM DESCRIPTION                                    | 2. NUMBER | LV-3.8-21 |
|----------|--|-----------|-----------|
| 1. TITLE | Launch Vehicle Countdown Procedures and Deviations | 3. DATE   | 8/26/97   |

To provide documentation requirements to demonstrate launch vehicle countdown processes and the methodologies incorporated to identify and track any deviations in the launch terminal count sequence.

#### 5. DATA REQUIREMENTS

The contractor shall provide detailed launch terminal vehicle countdown procedures to be used during the launch terminal countdown process. The procedures shall be prepared in accordance with launch site activities, spacecraft interface requirements, and launch performance requirements to ensure an end-to-end comprehensive approach for vehicle launch.

- a. Launch countdown milestones, objectives, and philosophy
- b. Integrated launch countdown procedures
- c. Deviation and waiver guidelines and procedures

#### 6. SPECIAL PREPARATION INSTRUCTIONS

The spacecraft contractor shall deliver all the specified number of copies to the Delta IV CCAFS NASA Drop Box. A formal letter shall be provided to the contracting officer (at NASA/GSFC) to formally document the delivery and contract compliance.

CCR4343A, Mc CCR4353C, Mc





| DATA ITEM DESCRIPTION |                                       | 2. NUMBER | LV-3.8-22 |
|-----------------------|---------------------------------------|-----------|-----------|
| 1. TITLE              | Launch Vehicle Launch Commit Criteria | 3. DATE   | 8/26/97   |

A list of conditions which must be met to proceed with launch.

#### 5. DATA REQUIREMENTS

The contractor shall prepare and document the launch commit criteria, and document the criteria to be used to commit the GOES launch vehicle for launch. The document shall address the launch vehicle, the launch vehicle launch control center(s), launch critical GSE and associated activities prior to liftoff.

Each telemetry parameter shall be tabulated with its acceptable values, tolerances, and out-of-limits conditions which would require a resolution prior to launch.



#### 6. SPECIAL PREPARATION INSTRUCTIONS

The spacecraft contractor shall deliver all the specified number of copies to the Delta IV CCAFS NASA Drop Box. A formal letter shall be provided to the contracting officer (at NASA/GSFC) to formally document the delivery and contract compliance.

CCR4343A, Mo CCR4353C, Mo



| DATA ITEM DESCRIPTION |   | 2. NUMBER | LV-3.8-23 |
|-----------------------|---|-----------|-----------|
| 1. TITLE              | Senior NASA Management Mission Readiness<br>Review Data Package | 3. DATE   | 8/26/97   |

The Senior NASA Management Mission Readiness Review (MRR) is held to certify the readiness of the spacecraft and launch vehicle to proceed with launch site operations and toward launch countdown. The MRR is co-chaired by the OSF Director ELV Requirements, the Enterprise Deputy Associate Administrator and the Deputy Center Director assigned Mission responsibility, or their designees. The MRR is hosted by the Mission Director at approximately 1 month before launch.

#### 5. DATA REQUIREMENTS

The MRR Data Package shall include the following minimal material:

- a. Integrated package of presentation material of mission status from spacecraft, vehicle, launch site, range and support organizations.
- b. Summary of any spacecraft or launch vehicle Open Paper, Actions or risks since the last program review
- c. Written record of the verbal recommendation from the Mission Team to proceed toward Launch Countdown operations



#### 6. SPECIAL PREPARATION INSTRUCTIONS

- a. An advanced copy of the integrated presentation package submitted to the NASA Mission Director at least five days prior to the MRR.
- b. The MRR must be an integrated review and include input relative to at least the following:
  - 1. Mission status
  - 2. Status of actions/closeouts from/since last program review
  - 3. Open work/closeout plans
  - 4. Tracking, telemetry, and communications support status
  - 5. Launch site/range support/service status
  - 6. Vehicle configuration, critical 1st flight items, assembly and checkout history
  - 7. Flight design/performance margins
  - 8. SR&QA history
  - 9. Constraints to launch
  - 10. Spacecraft assembly and checkout status
  - 11. Failure Reaction Plan
  - 12. Mission risks

#### Presenters:

NASA Spacecraft Project

NASA Launch Services Project

NASA Launch Manager

NASA SR&QA Field Installation Organizations

Spacecraft/Launch Service Contractors

Range Support/Operations





| DATA ITEM DESCRIPTION |                         | 2. NUMBER | LV-3.8-24 |
|-----------------------|-------------------------|-----------|-----------|
| 1. TITLE              | Pre-Payload Mate Review | 3. DATE   | 8/26/97   |

The Pre-Payload Mate Review (Launch site Readiness Review) shall be an integrated spacecraft/launch vehicle review to establish the readiness of both elements for spacecraft integration with the launch vehicle.

#### 5. DATA REQUIREMENTS

This review data package shall cover, as a minimum, items listed below and any other activities of either the spacecraft or the launch vehicle which could affect integrated operations.

- a. Transportation and mate of the spacecraft to the launch vehicle
- b. Integrated testing to be accomplished once mated
- c. Ability of the launch vehicle to support spacecraft checkout activities (telemetry, umbilical, etc.)
- d. Electrical/mechanical interface readiness for mate
- e. Configuration management of the spacecraft to launch vehicle
- f. Launch Pad services readiness including HVAC, power, humidity, cleanliness, cranes, purges, etc.

#### 6. SPECIAL PREPARATION INSTRUCTIONS

CCR 4353C Mod85





| DATA I   | TEM DESCRIPTION                            | 2. NUMBER | LV-3.8-25 |
|----------|--|-----------|-----------|
| 1. TITLE | Launch Readiness Review (LRR) Data Package | 3. DATE   | 8/26/97   |

The NASA Launch Readiness Review (LRR) is an integrated review held to (a) update the mission status (including the spacecraft and launch vehicle), (b) close-out actions from the previously held MRR, (c) authorize approval to proceed into launch countdown, and (d) sign the Certificate of Flight Readiness (COFR). The NASA LRR is co-chaired by the NASA Mission Director and the NASA Launch Manager, and is held at the launch site, no later than one day before launch.

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#### 5. DATA REQUIREMENTS

The NASA LRR Data Package shall include the following minimal material:

- a. Integrated package of presentation material from spacecraft, vehicle, launch site, range, and support organizations
- b. Summary of any spacecraft or launch vehicle Open Paper, Actions, or risks since the last program review
- c. Written record of the verbal recommendation from the Launch/Support Team to proceed into Launch Countdown operations
- d. Certificate of Flight Readiness signed by at least the NASA Mission Director, the NASA Launch Manager, the Launch Services Contractor, the Spacecraft contractor, NOAA Program Representative, and the Range Commander.

#### 6. SPECIAL PREPARATION INSTRUCTIONS

- a. An advanced copy of the integrated presentation package submitted to the NASA Launch Manager at least 1 day prior to the NASA LRR.
- b. The NASA LRR must be an integrated review and address and include inputs relative to at least the following:
  - 1. Mission status
  - 2. Status of actions/closeouts from/since last program review
  - 3. Open work/closeout plans
  - 4. Tracking, telemetry, and communications support status
  - 5. Launch site/range support/service status
  - 6. Weather briefing
  - 7. Public Affairs Support Plan

#### Presenters:

NASA Spacecraft Project

NASA Launch Services Program

NASA Launch Manager

NASA SR&QA Field Installation Organizations

Spacecraft/Launch Service Contractors

Range Support/Operations



| DATA IT | EM DESCRIPTION                         | 2. NUMBER | LV-3.8-26 |
|---------|--|-----------|-----------|
| . TITLE | Launch Vehicle Post Launch Data Report | 3. DATE   | 8/26/97   |

Provide detailed description of post launch vehicle performance.

# 5. DATA REQUIREMENTS

The contractor shall prepare a detailed data report that identifies launch vehicle performance/telemetry parameters plus count down milestones and events, and any anomalies or off-nominal performance deviations noted during launch countdown or in-flight operations.

# 6. SPECIAL PREPARATION INSTRUCTIONS



| DATA ITEM DESCRIPTION |  | 2. NUMBER | LV-3.8-29 |  |
|-----------------------|--|-----------|-----------|--|
| . TITLE               | Launch Operations Training Documentation | 3. DATE   | 4/21/03   |  |

The spacecraft contractor shall develop a GOES specific Launch Base Processing Training Package. The training is intended for the spacecraft contractor personnel and the government personnel prior to the start of launch activities.

#### 5. DATA REQUIREMENTS

The training package shall include launch base activities required to prepare the GOES spacecraft for launch. The training topics shall encompass the spacecraft arrival at the Payload Processing Facility (e.g. Astrotech) through the launch countdown operations. The training package shall include:

1) Spacecraft system overview and Launch Vehicle/Spacecraft Interfaces

2) Summary of previous as-run launch campaign operations (or, for GOES-N, launch campaign planning)

3) The description of all spacecraft launch base integration and test activities presented chronologically with references to estimated duration. This shall include all spacecraft standalone and spacecraft/launch vehicle integrated activities.

4) The identification of external support requirements as applicable (e.g. purge gas analysis, fuel/oxidizer analysis, etc)

5) The test procedure identification and description

6) The description of the Payload /Hazardous Processing Facilities (PPF/HPF) (include procedure hazardous/non-hazardous classification).

7) The description of the Launch Complex mission unique configurations in support of spacecraft operations (EGSE configurations [overview level])

8) The description of mechanical/logistical support requirements (including S/C transportation and handling)

9) The description of contamination control requirements (including purge requirements/configurations)

10) The description of the voice/data/video communications requirements/configurations in support of spacecraft test/launch operations

11) The description of planned launch countdown support (Spacecraft personnel by function/title/location)

12) The description of the launch-day chain of command and the anomaly resolution process (spacecraft or integrated anomalies).

#### 6. SPECIAL PREPARATION INSTRUCTIONS



# Attachment H

# LIST OF GOVERNMENT FURNISHED PROPERTY

August 26, 1997



# Attachment H

# LIST OF GOVERNMENT FURNISHED PROPERTY

August 26, 1997

# LIST OF GOVERNMENT FURNISHED PROPERTY

| ITEM (GFP)  | DATE AVAILABLE                          | LOCATION (SOW) |
|---|---|----------------|
| Finite Element Models                                 |   | 3.2.2.1        |
| Imager  | SCR                                     | 3.2.2.1        |
| Sounder   | *                                       |                |
| SXI   | SCR                                     | İ              |
| Thermal Models  | SCR                                     | 2051           |
| Imager (Detailed TMG)                                 | l ggp                                   | 3.2.5.1        |
| Sounder (Detailed TMG)                                | SCR                                     |                |
| · · · · · · · · · · · · · · · · · · ·                 | SCR                                     |                |
| SXI (Reduced Thermal Model) Thermal Distortion Models | SCR                                     |                |
|   |   | 3.2.5.3        |
| Imager  | SCR                                     |                |
| Sounder   | SCR .                                   |                |
| Test Execution System (TES)                           | July 1999                               |                |
| Prototype Instruments                                 |   | 3.4.3.1        |
| S/N02 Imager  | July 1999                               |                |
| S/N02 Sounder   | July 1999                               |                |
| SXI Mass Model  | Sept. 1, 1999                           |                |
| SXI Engineering Model                                 | October 2, 2000                         |                |
| Flight Instruments                                    |   |                |
| S/N08 Imager  | December 1, 2000                        |                |
| S/N08 Sounder   | December 1, 2000                        | •              |
| S/N09 Imager  | April 2001                              |                |
| S/N09 Sounder   | April 2001                              | •              |
| S/N10 Imager  | August 2003                             |                |
| S/N10 Sounder   | August 2003                             |                |
| S/N11 Imager  | April 2005                              | <i>:</i> *     |
| S/N11 Sounder   | April 2005                              |                |
| <u>SXI-N</u>  | No earlier than Oct. 15, 2001           |                |
| (MOD 59, CCR6184B)                                    | No later then the start of GOES N       |                |
|   | EMI/EMC S/C-level test minus<br>4 weeks | *              |
| SXI-O   | April 2002                              |                |
| SXI-P   | October 2003                            |                |
| SXI-Q   | April 2007                              |                |
| Tooling Plates & Associated Drawings                  |   |                |
| mager   | March 1999                              |                |
| Sounder   | March 1999                              |                |
| nstrument Drawings & ICDs                             | Transaction 1999                        |                |
| mager   | Award                                   |                |
| Sounder   | Award                                   |                |
| SXI   | Award                                   |                |



| Instrument Operations Documentation                  |                       | 3.6.1.2  |
|--|-----------------------|--|
| Imager   | Inst. Del'y - 3 Mo.   | 3.0.1.2  |
| Sounder  | Inst. Del'y - 3 Mo.   |  |
| SXI  | Inst. Del'y - 3 Mo.   |  |
| Instrument Simulators                                | mist. Dei y - 3 Mo.   |  |
| Imager   | GOES-N *ESD - 20 Mos. |  |
| Sounder  | GOES-N ESD - 20 Mos.  |  |
| SXI  | •                     |  |
| IR Calibration Targets (T/V Testing)                 | February 28, 2000     |  |
| (And associated controllers, plumbing, etc.):        |                       |  |
| Space Targets (T/V Tests)                            | S/N109 D-12           |  |
| Cooler Targets (T/V Tests)                           | S/N08 Del'y           | ern om mår ummer utrikke kade en kriste mår menskar i en fræm kallendarning mille sædet sæm i en som |
| Narrow Field Collimator (Ambient Test)               | S/N08 Del'y           |  |
| Integrating Sphere (Ambient Test)                    | S/N02 Del'y           |  |
|  | S/N02 Del'y           |  |
| Imager/Sounder Lifting Fixture                       | S/N02 Del'y           |  |
| Wide Field Collimator with Targets                   | March 1999 thru       | 3.4.4.3.1.2  |
|  | November 1999 and     |  |
| GGCG D 1 / 11 C                                      | March 2000            |  |
| SSGS Related Information                             |                       | 3.5  |
| GOES I/M Sftwr. & Databases                          |                       | GFE (1)  |
| GOES I/M Documentation (Electronic)                  |                       | GFE (2)  |
| GOES N Ground Network Compatibility Test Suite       | Prior to In-Plant     | 3.6.2.1.1  |
|  | Environment Tests     |  |
| SXI Data Playback Unit                               | January 15, 2000      |  |
| DCPR Uplink, Downlink Modems & interconnect          | October 1, 2001       | 3.4.4.4.4  |
| hardware (MOD 59, CCR6184B)                          | <u> </u>              | 5.11.11.11   |
| (13) Sun Microsystems Sun Fire V480 Servers          | 7 2004                | #25410   |
|  | June 2004             | ¶ 3.5.4.1 & 3.5.4.2  |
| Dual-Processor, 6 GB RAM, (2) 36 GB Disks,           |                       | 3.3.7.2  |
| And Solaris 2.9 Operation Systems (Mod 95,CCR 4381)) |                       |  |
| (4) Sun Microsystems Sun Fire V240 Servers           | June 2004             | ¶ 3.5.4.1 &  |
| For GAIM Rehost, Single Processors, 36 GB Disk       | June 2004             | 3.5.4.2  |
| (Mod 95,CCR 4381))                                   |                       |  |
| (18) Sun Fire V240 Servers for MRS&S Rehost          | June 2004             | ¶ 3.5.4.1 &  |
| (Mod 95,CCR 4381))                                   | June 2007             | 3.5.4.2  |
| (18) Time Code Reader Cards, (18) Frame              | June 2004             | ¶ 3.5.4.1 &  |
| Synchronization Cards, (18) Frame Synchronization    | June 2007             | 3.5.4.2  |
| Card Interface Cables for MRS&S                      |                       |  |
| (Mod 95,CCR 4381))                                   |                       |  |
| (6) Sun Microsystems Forte C++ Personnel Edition     | June 2004             | ¶ 3.5.4.1 &  |
| 6 software kits                                      | June 2004             | ∥ 3.5.4.1 &<br>3.5.4.2   |
| (Mod 95,CCR 4381))                                   |                       | · · · <del></del>  |
| FSD = Farliest Storage Date                          |                       |  |

\*ESD = Earliest Storage Date



## ATTACHMENT I

# PROGRAM REVIEW REQUIREMENTS

**FOR** 

# THE GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE

GOES-N, O, P, Q

**AUGUST 26, 1997** 

NASA/GODDARD SPACE FLIGHT CENTER GREENBELT, MARYLAND 20771

# PROGRAM REVIEW REQUIREMENTS

# **FOR**

# THE GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE

GOES-N, O, P, Q

| Prepared by: | Original signed by John P. Lahzun Systems Engineering Manager | 8/26/97<br>Date |
|--------------|---|-----------------|
|              |   |                 |
| Approved by: | Original signed by Kenneth O. Schwer GOES Observatory Manager | 8/26/97<br>Date |
|              | Original signed by Martin A. Davis GOES Project Manager       | 8/26/97<br>Date |
|              | Original signed by Thomas M. Wrublewski NOAA Representative   | 8/26/97<br>Date |

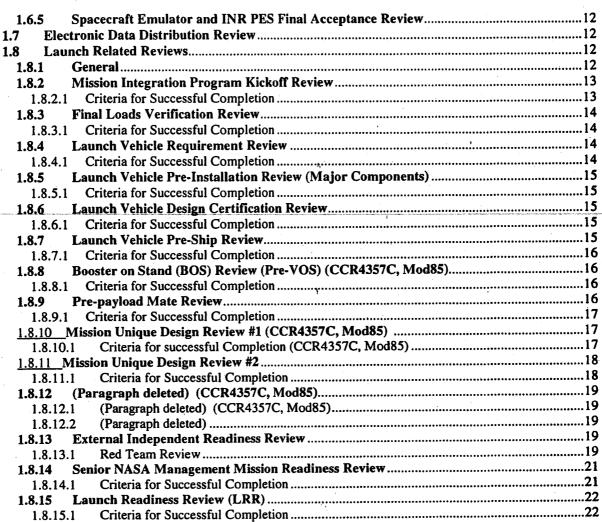


# TABLE OF CONTENTS

|          |  | 4        |
|----------|--|----------|
| 1 PROGR. | AM REVIEW REQUIREMENTS                                     | I        |
| 1.1 Gei  | neral  | I        |
| 111      | Program Review Summary                                     | l        |
| 1.2 Spa  | secraft Contractor Peer Review Requirements                | I        |
| 1.3 Spa  | accoraft Daviosys  | Z        |
| 1.3.1    | Conoral  | Z        |
| 122      | System Concent Review                                      | 4        |
| 1.3.2.   | 1 - Criteria for Successful Completion                     |          |
| 1.3.3    | Preliminary Design Review                                  | 5        |
| 1.3.3.   | 1 Criteria for Successful Completion                       | <i>э</i> |
| 1.3.4    | Critical Design Review                                     | 4        |
| 1.3.4.   | 1 Criteria for Successful Completion                       | 4        |
| 135      | Mission Operations Review                                  | ع        |
| 135      | 1 Criteria for Successful Completion                       |          |
| 1.3.6    | Pre-Environmental Review                                   | ⊃        |
| 1.3.6.   | 1 Criteria for Successful Completion                       | دک       |
| 1.3.7    | Pre-Shin and Pre-Storage Reviews                           | د        |
| 1.3.7.   | 1 Criteria for Successful Completion of Pre-Ship Review    | ວ        |
| 1.3.7.   | 2 Criteria for Successful Completion of Pre-Storage Review | 6        |
| 1.3.8    | Flight Operations Review                                   | 0        |
| 1.3.8.   | 1 Criteria for Successful Completion                       | 0        |
| 1.3.9    | Launch Readiness Review                                    | 0        |
| 1.3.9.   | 1 Criteria for Successful Completion                       | o        |
| 1.3.10   | Spacecraft Engineering Handover Review                     | 7        |
| 1.3.10   | 1 Criteria for Successful Completion                       | /        |
| 1.3.11   | Launch and Orbit Raising (LOR) Data Review                 | /        |
| 1.3.1    | 1.1 Criteria for Successful Completion                     | /        |
| 1.3.12   | Systems Verification Review                                | /        |
| 1.3.13   | 2.1 Criteria for Successful Completion                     | 7        |
| 1.3.13   | INR System Verification Review                             | ٥        |
| 1.3.1    | 3.1 Criteria for Successful Completion                     | c        |
| 1.4 So   | ftware Subsystem Reviews                                   | გ        |
| 1.4.1    | General  | c        |
| 1.4.2    | Software Concept Review                                    | د        |
| 1.4.3    | Software Requirements Review                               | ۲        |
| 1.4.4    | Software Preliminary Design Review                         | ۲        |
| 1.4.5    | Software Critical Design Review                            | د>       |
| 1.4.6    | Software Test Readiness Review                             | ۲        |
| 1.4.7    | Software Acceptance Review                                 | >        |
| 1.5 Sp   | acecraft Support Ground System (SSGS) Reviews              | ١٠.١٠    |
| 1.5.1    | General  | ١١       |
| 1.5.2    | SSGS System Concept Review                                 | 10       |
| 1.5.3    | SSGS Preliminary Design Review                             | ١١       |
| 1.5.4    | SSGS Critical Design Review                                | 10       |
| 1.5.5    | SSGS Pre-Shipment Review                                   | I .      |
| 1.5.6    | SSGS Final Acceptance Review                               | ŀ        |
| 1.6 Sp   | pacecraft Emulator Reviews                                 | 1        |
| 1.6.1    | General  | 1        |
| 1.6.2    | Spacecraft Emulator and INR PES System Concept Review      | I        |
| 1.6.3    | Spacecraft Emulator and INR PES Preliminary Design Review  | 1.       |
| 1.6.4    | Spacecraft Emulator and INR PES Critical Design Review     | 12       |









# 1 PROGRAM REVIEW REQUIREMENTS

#### 1.1 General

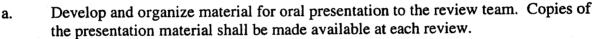
The program review requirements shall be in accordance with the requirements described herein.

The program reviews will be used by NASA as "control gates" that NASA management personnel will use to make program go/no-go decisions. Following the presentation of each review, a program evaluation will be made by NASA to determine if the contractor has satisfactorily completed all the necessary work, and whether there are any program deficiencies.

If any deficiencies are found, the spacecraft contractor will be required to develop a corrective action plan for the deficiencies prior to proceeding with the affected program development. The program reviews are summarized in Table 1.1 in the Statement of Work (SOW), S-415-23.

#### 1.1.1 Program Review Summary

For each program review the spacecraft contractor shall:



b. Support splinter review meetings resulting from the major review.

- c. Produce written responses to recommendations and action items resulting from the review.
- d. Document and provide the results of the contractor's reviews at the component, subsystem and system level.
- e. Include system safety as an agenda item for each S/C review.

# 1.2 Spacecraft Contractor Peer Review Requirements

The spacecraft contractor shall implement a program of peer reviews at the component and subsystem level. The program shall, as a minimum, consist of a Preliminary Design Review (PDR) and a Critical Design Review (CDR). In addition, packaging reviews shall be conducted on all electrical and electromechanical components in the flight system as a part of the PDR and CDR design reviews.

If a packaging review was previously held on a product line or heritage component, and there is agreement between the GSFC and the contractor that the GOES N-Q application and performance is identical with the proposed heritage component, then the Packaging Review does not need to be repeated.

The PDR and CDR shall evaluate the ability of the component to successfully perform its function under operational and environmental conditions during both testing and flight. The





results of parts stress analysis and component packaging reviews, including the results of associated tests and analysis, shall be discussed at the component PDRs and CDRs.

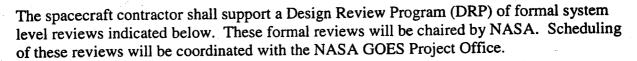
The packaging reviews shall specifically address the following:

- a. Placement, mounting, and interconnection of electronic, electrical and electromechanical (EEE) parts on circuit boards or substrates.
- b. Structural support and thermal accommodation of the boards and substrates and their interconnections in the component design.
- c. Provisions for protection of the parts and ease of inspection.

The peer reviews shall be conducted by personnel who are not directly responsible for design of the hardware under review. NASA reserves the right to attend the peer reviews and requires 10 working days notification. The minutes and action items that result from these reviews shall be documented by the spacecraft contractor, and all design review documentation shall be made available on the electronic data distribution system (EDDS) to NASA.

# 1.3 Spacecraft Reviews

#### 1.3.1 General



- a. System Concept Review (SCR)
- b. Preliminary Design Review (PDR)
- c. Critical Design Review (CDR)
- d. Mission Operations Review (MOR)
- e. Pre-Environmental Review (PER)
- f. Pre-Ship Review (PSR)
- g. External Independent Readiness Review (EIRR)
- h. Flight Operations Review (FOR)
- i. Launch Readiness Review (LRR)
- j. Launch and Orbit Raising (LOR) Data Review (LDR)
- k. Engineering Handover Review (EHR)

The DRP for GOES-N will consist of all of the above reviews. The DRP for identical follow-on spacecraft shall consist of the MOR, PER, PSR, EIRR, FOR, LRR, LDR, and EHR. Reviews for spacecraft changes will be determined as described in the SOW, S-415-23, Section 1.1.

# 1.3.2 System Concept Review

The data requirements for the SCR are described in the CDRL, S-415-26, item SE-2.1-01.



#### 1.3.2.1 Criteria for Successful Completion

The criteria for successfully conducting and completing the System Concept Review (SCR) are as follows:

- Has the spacecraft contractor proposed any solutions and/or design concepts that are a. not technically feasible?
- Will the proposed system design meet the system requirements, satisfy the mission b. objectives, and address operational needs?
- Can the top-level system design selected be built in a timely manner? Are the C. schedule estimates valid in view of the system requirements and selected architecture?
- d. Have the component and subsystem level concept design reviews been satisfactorily completed?
- Have the major design issues for the components and subsystems been identified? e. Have major risk areas been identified with mitigation plans?
- f. Are the system-level requirements complete, consistent and verifiable?
- Have all the system level requirements been allocated to one or more lower levels? g.
- Have all requirement trade studies been identified to permit selection of a final h. system design?
- Has the spacecraft contractor demonstrated that the proposed designs are acceptable i. and that requirement allocations are complete?
- Has a performance verification plan and preliminary verification program been i. satisfactorily defined?
- k. Have preliminary interface control drawings and documentation been prepared?
- Have the system safety plans been satisfactorily addressed? 1.
- Has an Office of Flight Assurance (OFA) post-award mission assurance survey been m. completed and key action items addressed?

#### 1.3.3 Preliminary Design Review

The data requirements for the PDR are described in CDRL SE-2.1-02.

#### 1.3.3.1 Criteria for Successful Completion

The criteria for successful completion of the PDR are as follows:

- All key system requirements have been allocated to the subsystem and component level a.
- and the flow down is adequate to verify system performance.

  The design solutions being proposed are expected to meet the performance and functional requirements at the component and/or subsystem level.

  There is enough evidence in the proposed design approach to proceed further with the b.
- c. next step of detailed design phase.
- The design is verifiable and does not pose major problems which may cause schedule d. delays.





- e. There is evidence that the preliminary design will meet performance and schedules as planned.
- f. Overall system architecture has been established and all the external interfaces have been identified.
- g. All key system, subsystem and component specifications are complete and ready for formal approval.
- h. The proposed design does not violate any safety requirements which will endanger human life or mission success.
- i. The design solution is producible based on existing processes and techniques; if not, risk areas which require unique and unproved processes are identified and plans established.
- j. There are no, or a minimum number of, long lead items which may threaten schedule compliance.
- k. Required resources (workforce and facilities) are available to proceed further.
- 1. An acceptable operations concept has been developed.
- m. Preliminary launch vehicle interfaces have been defined.
- n. All action items from the post-award Office of Flight Assurance (OFA) mission assurance survey have been closed out.

### 1.3.4 Critical Design Review

The data requirements for the CDR are described in CDRL SE-2.1-03.

# 1.3.4.1 Criteria for Successful Completion

The criteria for successful completion of the CDR are as follows:

- a. All key technical problems and design anomalies have been resolved without compromising system performance, reliability and safety.
- b. The detailed design will meet performance and functional requirements.
- c. All key recommendations from subsystem and/or component design reviews by specialityspecialty engineering groups, manufacturing, safety, quality, operations and utilization and test organizations have been answered and all action items are closed.
- d. The design can be smoothly transitioned into the manufacturing phase.
- e. The program is ready to commit to setting up tooling, facilities and manpower to fabricate, integrate and test based on the design baseline.
- f. There is substantial evidence that the detailed design will meet the performance and schedule as planned.
- g. Fabrication drawings have been completed with a complete inventory of bill of material including any long lead items.
- h. Software simulations and prototyping results do not present any potential risks which may hamper software coding and integration.
- i. All key subsystem and/or component engineering analyses are complete, accurate and the detailed design is based on these results.
- j. Integrated safety analysis shows that there are no outstanding hazards which cannot be controlled or are within an acceptable risk level if waivers are required.
- k. Launch vehicle interface and interface compatibility test plans have been defined.





#### 1.3.5 Mission Operations Review

The data requirements for the MOR are described in CDRL SE-2.1-04.

#### 1.3.5.1 Criteria for Successful Completion

The criteria for successful completion of the MOR are as follows:

- a. \_\_Ground station launch network and network compatibility test plans are defined.
- b. \_\_Operations Control Facility is defined.
- c. Flight dynamics support services are defined and ready to support mission operations.
- d. Post-launch test procedures and contingency procedures are ready to support mission operations.

#### 1.3.6 Pre-Environmental Review

The data requirements for the PER are described in CDRL SE-2.1-05.

#### 1.3.6.1 Criteria for Successful Completion

The criteria for successful completion of the PER are as follows:

- a. All remaining key procurement activities will be initiated and all fabrication activities will be completed.
- b. The process of integrating the spacecraft, including payload instruments will be complete.
- c. Have the system safety plan(s) been satisfactorily prepared and presented?
- d. Environmental test plans and procedures are complete, approved and ready to support spacecraft environmental testing.
- e. Ground support equipment hardware and software configurations are frozen and ready to support S/C environmental testing.

# 1.3.7 Pre-Ship and Pre-Storage Reviews

The data requirements for the PSR and PSTR are described in CDRL SE-2.1-06 and SE-2.1-09.

# 1.3.7.1 Criteria for Successful Completion of Pre-Ship Review

The criteria for successful completion of the Pre-Ship Review are as follows:

- a. All key functional and environmental testing of the entire satellite will be satisfactorily completed.
- b. The close-out of all non-conformance reports will be completed.
- c. There are no unexplained anomalies in the spacecraft trend data base.





- d. The Spacecraft Transportation and Handling Plan has been approved and is ready to support the transportation and handling of the satellite.
- e. Launch base test plans and procedures are approved and ready to support the testing and processing of the satellite at the launch facilities.
- f. All waivers and deviations have been approved.

#### 1.3.7.2 Criteria for Successful Completion of Pre-Storage Review

The criteria for successful completion of the Pre-Storage Review are as follows:

- a. All key functional and environmental testing of the entire satellite will be satisfactorily completed.
- b. The close out of aAll non-conformance reports (PAs/TAs) have been dispositioned or have mutually agreed to closure plans, will be completed.
- c. There are no unexplained anomalies in the spacecraft trend data base.
- d. All waivers and deviations have been approved or <u>have mutually agreed to closure plans acceptable closure plan have been agreed to: (CCR4357C, Mod85)</u>
- e. The Spacecraft Storage Plan has been approved and is ready to support spacecraft storage.

#### 1.3.8 Flight Operations Review



#### 1.3.8.1 Criteria for Successful Completion

The criteria for successful completion of the FOR are as follows:

- a. Has the spacecraft contractor identified <u>theirhis</u> planned launch support team, and the personnel deployment plan?
- b. Has the spacecraft contractor completed preparation and release of all required launch support documentation?

#### 1.3.9 Launch Readiness Review

The data requirements for the LRR are described in CDRL SE-2.1-08.

#### 1.3.9.1 Criteria for Successful Completion

The criteria for successful completion of the LRR are as follows:

- a. Provide NASA certification that flight operations can proceed safely with acceptable risk.
- b. Confirm that the spacecraft and support elements are properly configured and ready for launch.
- c. Establish that all key interfaces are compatible and function as expected.
- d. Verify that all open items and waivers have been examined and found to be acceptable.





#### 1.3.10 Spacecraft Engineering Handover Review

The data requirements for the Spacecraft Engineering Handover Review are found in CDRL OPS-3.6.3-01. The Spacecraft Engineering Handover Review shall not require longer than one 8-hour day to present.

#### 1.3.10.1 Criteria for Successful Completion

The criteria for successful completion of the spacecraft EHR are as follows:

- a. Has the spacecraft contractor provided sufficient data to enable the government to take over control of the spacecraft without undue risk?
- b. Have all anomalies to date been resolved, <u>-or-mitigated or have mutually agreed to closure plans? (CCR4357C, Mod85)</u>
- c. Is the spacecraft ready for post-launch testing (PLT)?

#### 1.3.11 Launch and Orbit Raising (LOR) Data Review

The data requirements for the LOR Data Review are found in CDRL OPS-3.6.3-02. For a nominal mission orbit raising, this data review shall not require longer than three 8-hour days to present.

### 1.3.11.1 Criteria for Successful Completion

The criteria for successful completion of the spacecraft LOR are as follows:

- a. Has the spacecraft contractor proven their mission design assumptions were valid with actual flight data?
- b. Have all anomalies in the LOR period been resolved, <u>and</u> mitigated <u>or have mutually</u> agreed to closure plans? (CCR4357C, Mod85)

#### 1.3.12 Systems Verification Review

The data requirements for the SVR are described in CDRL SE-2.4.10.

#### 1.3.12.1 Criteria for Successful Completion

The criteria for successful completion of the SVR are as follows:

- a. All Performance and Interface requirements have been demonstrated to have been comprehensively allocated to sub-requirements.
- b. Each requirement has been traced to verification or a comprehensive set of verifications appropriate to fully demonstrate compliance to the requirement.
- c. The set of requirement verifications are clearly delineated, tracing to the Previously Qualified Hardware and Software Report (CDRL PA-3.7.1-02), analyses previously





delivered (subsystem analysis CDRLs), and test and demonstration plans (CDRL 2.4-01, item j.)

d. There is substantial evidence that the package of requirements verifications verifies at least once, by analysis or at some level of test, the complete set of GOES requirements and sub-allocated requirements. (CCR 4226C, MOD 49)

### 1.3.13 INR System Verification Review

The data requirements for the INR SVR are described in CDRL SE-2.4.11.

# 1.3.13.1 Criteria for Successful Completion

The criteria for successful completion of the INR Performance Verification are as follows:

a. The package of INR tests clearly demonstrates compliance with INR System requirements.

b. Each INR test is thoroughly planned including the resources required to conduct the test, the configuration of the test articles, the analyses of test data to be performed.

Where requirement verification is substantially performed by analysis, this review will demonstrate that the appropriate tests are performed to validate the analysis.

d. There is substantial evidence that the package of requirements verifications verifies at least once, by analysis or at some level of test, the complete set of INR flight/ground requirements and sub-allocated requirements (hardware & software). (CCR 4226C, MOD 49; Admin Chg)



#### 1.4.1 General

The spacecraft contractor shall support a DRP of software subsystem level reviews indicated below. The reviews will be chaired by NASA. Scheduling of these reviews will be coordinated with the NASA GOES Project Office.

- a. Software Concept Review (SWCR)
- b. Software Requirements Review (SWRR)
- c. Software Preliminary Design Review (SWPDR)
- d. Software Critical Design Review (SWCDR)
- e. Software Test Readiness Review (SWTRR)
- f. Software Acceptance Review (SWAR)

The GOES-N DRP shall consist of all of the above reviews. Reviews for software changes will be determined as described in the SOW, section 1.1.

Sixty days prior to each review, the spacecraft contractor shall prepare, coordinate and submit the agenda for each review to the NASA GOES Project office for concurrence and/or comments. The spacecraft contractor shall then provide to NASA the review package material 14 days prior to each review.





## 1.4.2 Software Concept Review

The SWCR shall address the feasibility of the proposed software concept and the definition of the concept. It shall also address the management, engineering, and mission assurance strategies and constraints to be used in the life-cycle phases that follow.

### 1.4.3 Software Requirements Review

The SWRR shall define each Computer Software Configuration Item (CSCI), the requirements for each CSCI or software element, and the interface requirements within the software element and with other spacecraft or ground segment elements. This review shall define the requirements for interfaces between the software and hardware. It shall address the allocation of system and subsystem requirements to the software. This review shall include a preliminary version of the test plans for each CSCI which is traceable to the requirements.

### 1.4.4 Software Preliminary Design Review

The SWPDR shall address the architectural design and functions for each of the CSCIs or software elements. It shall address the allocation of system, subsystem, and software requirements to the software architectural design, and shall provide traceability of the software requirements to the design, and to the test plans describing how the software requirements will be verified.

# 1.4.5 Software Critical Design Review

The SWCDR shall occur after the software designs have been finalized but prior to the writing of software code. The review topics shall include the detailed design of the element and its CSCI, the traceability of the finalized designs to the preliminary designs and to the requirements, implementation plans, data flows and interfaces, the plans for verification and validation, and security considerations.

#### 1.4.6 Software Test Readiness Review

The SWTRR shall address the maturity of the software requirements, design, and code for formal testing. It shall review the plans for validation of software element during the acceptance test program. The review shall address the adequacy of the planned tests to verify each of the design requirements of the Element and each of its CSCIs.

# 1.4.7 Software Acceptance Review

The SWAR for each element shall address its readiness for installation and validation with the overall spacecraft system. Review areas include test results, the success of implementation of each of the required functions, the status and adequacy of operations guides and users' documentation, and the software installation plans.





#### 1.5 Spacecraft Support Ground System (SSGS) Reviews

#### 1.5.1 General

The spacecraft contractor shall support a DRP of SSGS reviews indicated below. The design review material for the command encryptors shall also be presented at each of the SSGS reviews. These reviews will be chaired by NASA. Scheduling of these reviews will be coordinated with the NASA GOES Project Office.

- a. SSGS System Concept Review (SCR)
- b. SSGS Preliminary Design Review (PDR)
- c. SSGS Critical Design Review (CDR)
- d. SSGS Pre-shipment Review (PSR)
- e. SSGS Final Acceptance Review (FAR)

The GOES-N DRP shall consist of the above reviews. Reviews for SSGS changes shall be determined as described in the SOW, section 1.1.

Sixty days prior to each review, the spacecraft contractor shall prepare, coordinate and submit the agenda for each review to the NASA GOES Project office for concurrence and/or comments. The spacecraft contractor shall then provide to NASA the review package material 14 days prior to each review.



#### 1.5.2 SSGS System Concept Review

The SCR shall describe the SSGS design concept, and verify that major performance requirements and interfaces are understood and requirements will be met. Major hardware and software design alternatives and supporting trade studies shall be presented for discussion. Performance and schedule risk areas and "tall poles" shall also be discussed and workarounds proposed. See CDRL SE-2.1-01, for data package guidelines.

#### 1.5.3 SSGS Preliminary Design Review

The PDR shall describe the overall SSGS design, detailing the purpose and function of each SSGS element and its internal and external interfaces. It shall also describe the architecture of each SSGS element, present a detailed software design, and a detailed hardware design showing the alternatives examined. The hardware design shall also provide estimates of space, electrical power, and environmental requirements. The PDR shall also present the contractor's SSGS test program plan. See CDRL SE-2.1.02 for data package guidelines.

## 1.5.4 SSGS Critical Design Review



The CDR shall present the contractor's final detailed system, software, and hardware design, addressing all comments and concerns arising at the PDR. The CDR shall also describe the proposed GOES N-Q SSGS LAN/WAN configuration. Final calculations shall be provided for system performance, space, power, and environmental requirements. Draft test plans shall also



be provided for the various tests described in paragraph 3.5.3 of the SOW. See CDRL SE-2.1-03 for data package guidelines.

#### 1.5.5 SSGS Pre-Shipment Review

The PSR shall present the results of the Pre-Shipment Test (PST) and demonstrate that any discrepancies found during the PST have been corrected. See CDRL SE-2.1-06 for data package guidelines.

#### 1.5.6 SSGS Final Acceptance Review

The Final Acceptance Review shall present the results of the Post-Shipment Verification Test and Final Acceptance Test, and shall demonstrate that all identified discrepancies have been corrected.

#### 1.6 Spacecraft Emulator Reviews

#### 1.6.1 General

The spacecraft contractor shall support a DRP of spacecraft emulator and INR performance evaluation system (PES) level reviews indicated below. These reviews will be chaired by NASA. Scheduling of these reviews will be coordinated with the NASA GOES Project Office.

- a. System Concept Review (SCR)
- b. Preliminary Design Review (PDR)
- c. Critical Design Review (CDR)
- d. Final Acceptance Review

The GOES-N DRP shall consist of all of the above reviews. Reviews for changes shall be determined as described in the SOW, section 1.1.

Sixty days prior to each review, the spacecraft contractor shall prepare, coordinate and submit the agenda for each review to the NASA GOES Project office for concurrence and/or comment. The spacecraft contractor shall then provide to NASA the review package material 14 days prior to each review.

## 1.6.2 Spacecraft Emulator and INR PES System Concept Review

The SCR shall describe the Spacecraft Emulator and INR PES design concept, verifying major performance requirements and interfaces are understood and requirements will be met. Major hardware and software design alternatives and supporting trade studies shall be presented for discussion. Performance and schedule risk areas and "tall poles" shall also be discussed and workarounds proposed.





# 1.6.3 Spacecraft Emulator and INR PES Preliminary Design Review

The PDR shall describe the overall Spacecraft Emulator and INR PES design, detailing the purpose and function of each element and its internal and external interfaces. It shall also describe the architecture of each element, present a detailed software design, and a detailed hardware design showing the alternatives examined. The hardware design shall also provide estimates of space, electrical power, and environmental requirements. The PDR shall also present the spacecraft contractor's test program plan.

# 1.6.4 Spacecraft Emulator and INR PES Critical Design Review

The CDR shall present the contractor's final detailed system, software, and hardware design, addressing all comments and concerns arising at the PDR. Final calculations shall be provided for system performance, space, power, and environmental requirements. Draft test plans shall also be provided.

# 1.6.5 Spacecraft Emulator and INR PES Final Acceptance Review

The Final Acceptance Review shall present the results of the Post-Shipment Verification Test and Final Acceptance Test and shall demonstrate that all identified discrepancies have been corrected.



The spacecraft contractor shall provide a CDR for the EDDS. This review will be chaired by NASA. Scheduling of this review shall be coordinated with the NASA GOES Project Office. Sixty days prior to the review, the spacecraft contractor shall prepare, coordinate and submit the proposed agenda for the review to the NASA GOES Project Office for concurrence and/or comment. The spacecraft contractor shall then provide to NASA the review package material 14 days prior to the review.

#### 1.8 Launch Related Reviews

#### 1.8.1 General

The spacecraft contractor shall ensure a DRP of launch related reviews indicated below. These reviews will be chaired by NASA. Scheduling of these reviews shall be coordinated with the NASA GOES Project Office.

Mission Integration Reviews:

- a. Mission Integration Program Kickoff Review (not required for Delta IV)
- b. Final Loads Verification Review

#### Launch Vehicle:

c. Launch Vehicle Requirements Review (LVRR) (not required for Delta IV)





- d. Launch Vehicle Pre-Installation Review (major components)
- e. Launch Vehicle Design Certification Review (LVDCR)
- f. Launch Vehicle Pre-ship Review
- g. Booster on Stand Review (Pre-VOS)
- h. Pre-Payload Mate Review
- i. Launch Vehicle Mission Peculiar/Mission Unique Design Review #1PDR
- j. Launch Vehicle Mission Peculiar/Mission Unique Design Review #2CDR
- k. (Deleted) (CCR4357C, Mod85)

#### Integrated Spacecraft/Launch Vehicle:

- 1. External Independent Readiness Review
- m. Senior NASA Management Mission Readiness Review
- n. Launch Readiness Review.

The GOES-N DRP shall consist of all of the above reviews. The DRP for identical follow-on launch vehicles shall only consist of the Mission Integration Program Kickoff Review, Final Loads Verification Review, Launch Vehicle Pre-Installation Review, Launch Vehicle Pre-Ship Review, Booster on Stand Review (Pre-VOS), EIRR, Pre-Payload Mate Review, Senior NASA Management MRR, and LRR. Reviews for spacecraft and/or launch vehicle changes will be determined as described in the SOW, section 1.1. (CCR4357C, Mod85)



#### 1.8.2 Mission Integration Program Kickoff Review

The data requirements for the Mission Integration Program Kickoff Review are described in the CDRL LV-3.8-07.

#### 1.8.2.1 Criteria for Successful Completion

The criteria for successful completion of the Program Kickoff Review are as follows:

- a. A mission integration plan, demonstrating the spacecraft contractor's management process for the integration of the spacecraft with the proposed launch vehicle is provided.
- b. The mission integration interface controls and requirements have been described in sufficient detail to ensure compatibility.
- c. Task descriptions and schedules for major integration reviews have been developed.
- d. Documentation requirements and release dates have been established and meet spacecraft and launch vehicle schedule requirements.
- e. Integration working groups have been defined and put in place.
- f. A decision process to be used for anomaly/problem resolution during the prelaunch and launch phases has been developed and agreed to by the spacecraft and launch vehicle contractor.





#### 1.8.3 Final Loads Verification Review

The data requirements for the Final Loads Verification Review are described in CDRL LV-3.8-17.

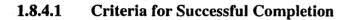
#### 1.8.3.1 Criteria for Successful Completion

The criteria for successful completion of the FLVR are as follows:

- a. Demonstrate/describe analyses were performed to ensure that the loads and vibration environment induced to the spacecraft do not exceed ICD requirements.
- b. Describe the analysis performed to ensure the dynamic loads imposed on the spacecraft do not exceed ICD requirements.
- c. Demonstrate traceability of all ICD requirements for spacecraft-launch vehicle loads in the analysis process.

#### 1.8.4 Launch Vehicle Requirement Review

The data requirements for the Launch Vehicle Requirement Review are described in CDRL LV-3.8-09.



The criteria for successful completion of the Launch Vehicle Requirement Review are described below.

- a. All system requirements have been identified and defined to a level which is adequate to verify launch vehicle performance capabilities.
- b. All physical interfaces have been defined, including, but not limited to, mechanical (i.e., spacecraft to launch vehicle), spacecraft envelope, access provisions, etc.
- c. All electrical interfaces have been defined, including, but not limited to, launch vehicle to spacecraft, spacecraft to umbilical, interfaces with electrical ground support equipment, pad electrical systems, ground batteries (if required), telemetry, grounding, power, etc.
- d. All functional interfaces have been defined, including, but not limited to, structures, structural loads, vibration, etc.
- e. All avionics systems and interfaces have been defined, including, but not limited to, spacecraft avionics interfaces with launch vehicle, separation systems, telemetry interfaces, spacecraft command and telemetry, RF, etc.
- f. Mass properties restrictions/limitations/requirements are defined and no known exceedances exist.
- g. All environmental requirements are defined, including, but not limited to, thermal, contamination, vibration, pressure, EMI/EMC, shock, launch complex RF, lightning, etc.



- h. All mission design requirements are defined, including, but not limited to, orbital requirements, launch vehicle performance, launch window injection, attitudes, rates, etc.
- i. All spacecraft/launch vehicle separation requirements are defined, including, but not limited to, separation conditions, launch vehicle post-separation maneuver requirements, telemetry, etc.

#### 1.8.5 Launch Vehicle Pre-Installation Review (Major Components)

The data requirements for the Launch Vehicle Pre-Installation Review are described in CDRL LV-3.8-16.

#### 1.8.5.1 Criteria for Successful Completion

The criteria for successful completion of the Launch Vehicle Pre-Installation Review are as follows:

- a. All functional and environmental end-to-end testing of each launch vehicle's major components shall be satisfactorily completed.
- b. The close-out of all non-conformance reports shall be completed.
- c. There are no unexplained anomalies in the launch vehicle trend data base.
- d. All waivers and deviations have been approved.
- e. All performance requirements of each component have been tested/verified per the contractor's processes.
- f. Requirement traceability to the ICD has been demonstrated.
- g. Component qualification testing has been successfully completed.

# 1.8.6 Launch Vehicle Design Certification Review

The data requirements for the LVDCR are described in CDRL LV-3.8-05.

# 1.8.6.1 Criteria for Successful Completion

The criteria for successful completion of the LVDCR are as follows:

- a. All <u>major</u> system/subsystem design changes are presented and demonstrate no reduction in vehicle performance capability. (CCR4357C, Mod85)
- b. Launch Vehicle-Spacecraft ICD requirements traceability into new system/subsystem design is demonstrated and tested.
- c. Design change implementation process follows the contractor's systems effectiveness program.
- d. Qualification process of new components/vendors is provided, and successful completion is demonstrated.

# 1.8.7 Launch Vehicle Pre-Ship Review



The data requirements for the Launch Vehicle PSR are described in the S-415-26 CDRL Item LV-3.8-20.

#### 1.8.7.1 Criteria for Successful Completion

The criteria for successful completion of the Launch Vehicle PSR are as follows:

- a. All key functional and environmental testing of the entire launch vehicle shall be satisfactorily completed.
- b. All electrical and mechanical interfaces have been successfully verified.
- c. Any open work being transferred to the launch site is identified and work closure plans in place and scheduled.
- d. The close-out of all non-conformance reports shall be completed.
- e. There are no unexplained anomalies in the launch vehicle trend data base.
- f. Transportation and handling plans have been approved and are ready to support the transportation and handling of the launch vehicle.
- g. Launch base test plans and procedures are approved and ready to support the testing and processing of the launch vehicle at the launch facilities.
- h. All waivers and deviations have been approved.

### 1.8.8 Booster on Stand (BOS) Review (Pre-VOS)



# 1.8.8.1 Criteria for Successful Completion

The criteria for successful completion of the BOS are as follows:

- a. All preflight test plans have been developed and approved.
- b. All waivers and/or deviations have been developed and approved.
- c. All coordination activities with range support are complete.
- d. All launch vehicle major components (first stage, interstage, solid motors, second stage, etc.) are properly configured and pre-assembly testing successfully accomplished.
- e. All launch members of launch support team have been identified.
- f. All facilities and systems have been configured and verified ready to support.
- g. Any vehicle system anomalies have been identified and a resolution plan in place.
- h. Any facility (pad, etc.) or facility system modifications required have been accomplished and verified operational.
- i. All mission unique configurations required have been identified and are supportable.
- j. All equipment maintenance, calibrations, time/cycle items meet requirements.
- k. All hazardous operations are documented and anomaly contingency plans are in place.



#### 1.8.9 Pre-payload Mate Review

The data requirements for the Pre-payload Mate Review are described in CDRL LV-3.8-24.



## 1.8.9.1 Criteria for Successful Completion

The criteria for successful completion of the Pre-Payload Mate Review is described below.

- a. Launch vehicle has been configured and tested and is ready for integration of spacecraft.
- b. Spacecraft has been configured, tested and is ready for integration with the launch vehicle.
- c. All integrated procedures are developed, approved, and in place for spacecraft to launch vehicle mate.
- d. All facility and facility (pad) systems are configured and verified ready to support.
- e. All safety procedures/hazardous operations have been identified, documented and approved.
- f. Encapsulation, transportation and lifting operations are thoroughly planned and understood by implementing personnel.
- g. All mechanical, structural, and electrical interfaces are verified ready to support.
- h. All launch pad systems and services are verified ready to support.

### 1.8.10 Launch Vehicle Mission Peculiar/Mission Unique Preliminary Design Review #1



The data requirements for the Launch Vehicle Mission Peculiar/Mission Unique Design Review #1 PDR are described in CDRL LV-3.8-11. (CCR4357C, Mod85)

### 1.8.10.1 Criteria for successful Completion

The criteria for successful completion of the Launch Vehicle Mission Peculiar/Mission Unique Design Review #1PDR are as follows:

- a. All system requirements have been allocated to the subsystem and component level and the flow-down is adequate to verify system performance.
- b. The design solutions being proposed are expected to meet the performance and functional requirement at the component and/or subsystem level.
- c. Recommendations from the subsystem and/or component design reviews by specialty engineering groups, manufacturing, safety, quality, operations and utilization and test organizations have been answered and all action items are closed. There is enough evidence in the proposed design approach to proceed further with the next step of detailed design phase.
- d. The design can be smoothly transitioned into the manufacturing phase. The design is verifiable and does not pose major problem which may cause schedule delays.
- e. There is evidence that the <u>preliminaryfinal detailed</u> design and vendor data will meet performance, and schedules as planned.
- f. Overall system architecture has been established and all the external interfaces have been identified.
- g. All system, subsystem and component specifications are complete and ready for formal approval.





- h. The proposed design does not violate any safety requirements which will endanger human life or mission success.
- The design solution is producible based on existing processes and techniques; if not, risk areas which require unique and unproved processes are identified and plans established.
- j. There are no, or a minimum number of, long lead items which may threaten schedule compliance.
- k. The program is ready to commit to setting up tooling, facilities and manpower to fabricate, integrate and test based on the design baseline. Required resources (workforce and facilities) are available to proceed further.
- Fabrication drawings have been completed with a complete inventory of bill of material including any long lead items. An acceptable operations concept has been developed.
- m. Preliminary launch vehicle interfaces have been defined.
- n. <u>Software simulations and prototyping results do not present any potential risks which</u>
  <u>may hamper software coding and integration.</u> <u>Preliminary plans are established for end-</u>
  <u>to end testing methodologies.</u>
- o. The identification of pertinent portions of software architecture, along with internal and external interfaces.
- p. <u>Launch vehicle/spacecraft compatibility test plans have been defined.</u>
- q. Verification of hardware design by IPTs and technologies and assurance that hardware modifications meet mission requirements, and that all modifications will be accounted for in the mission specific analysis. (CCR4357C, Mod85)



# 1.8.11 Launch Vehicle Mission Peculiar/Mission Unique Critical Design Review #2(CDR)

The data requirements for the Launch Vehicle Mission Peculiar/Mission Unique Design Review #2CDR are described in CDRL LV-3.8-12. (CCR4357C, Mod85).

# 1.8.11.1 Criteria for Successful Completion

The criteria for successful completion of the Launch Vehicle Mission Peculiar/Mission Unique Design rReview #2CDR are as follows:

- a. All technical problems and design anomalies have been resolved without compromising system performance, reliability and safety.
- b. The detailed design will meet performance and functional requirements. Vehicle performance with respect to mission and range safety requirements and vehicle modifications for the mission requirements has been established.
- c. All recommendations from subsystem and/or component design reviews by specialty engineering groups, manufacturing, safety, quality, operations and utilization and test organizations have been answered and all action items are closed. Mission specific analyses have been reviewed and the compatibility of the assigned vehicle with the mission objectives, mission requirements, and other related mission documents have been established.
- d. All key subsystem and/or component engineering analyses are complete, accurate and the detailed design is based on these results. The design can be smoothly transitioned into the manufacturing phase.





- e. <u>Integrated safety analysis shows that there are no outstanding hazards which cannot be controlled or are within an acceptable risk level if waivers are required. The program is ready to commit to setting up tooling, facilities and manpower to fabricate, integrate and test based on the design baseline.</u>
- f. <u>Launch vehicle/spacecraft compatibility test results have been presented. There is substantial evidence that the detailed design and vendor data will meet the performance and schedule as planned.</u>
- g. (Deleted)
- h. (Deleted)
- i. (Deleted)
- i. (Deleted)
- k. (Deleted)
- l. (Deleted) (CCR4357C, Mod85)
- **1.8.12** (Paragraph deleted) (CCR4357C, Mod85)
- **1.8.12.1** (Paragraph deleted) (CCR4357C, Mod85)
- 1.8.12.2 (Paragraph deleted)

#### 1.8.13 External Independent Readiness Review



The requirements for the EIRR are described in CDRL PM-1.3-06. The GOES-N review for the spacecraft shall include a detailed presentation of the overall spacecraft and launch vehicle programs, followed by an in-depth review by the review team members appointed by NASA. The appointed review team lead shall chair the review. Scheduling of this review will be coordinated with the NASA GOES Project Office. The subsequent program reviews for GOES-O, P, Q shall be presented as a delta review from the detail presentation of the overall programs, but will also include the same in-depth review as required for the GOES-N program. Following each review, the review team members will meet with the spacecraft and launch vehicle contractor's subsystem engineers, in a one-on-one environment for detailed discussions concerning any items of interest to the review team members. The spacecraft and launch vehicle contractors will be required to provide a written response to any action item that is submitted by the review team members.

Sixty days prior to the review, the spacecraft contractor shall prepare, coordinate and submit the agenda for the review to the NASA GOES Project Office for concurrence and/or comment. The spacecraft contractor shall then provide to NASA the review package material 14 days prior to the review.

The spacecraft and launch vehicle reviews will be held at the spacecraft and launch vehicle contractor's facility.

#### 1.8.13.1 Red Team Review



The requirements for the Red Team are described in CDRL PM-1.3-06. The GOES-N review for the spacecraft shall include a detailed presentation of the overall spacecraft, followed by an



in-depth review by the Red Team. The Red Team lead shall chair the reviews. Scheduling of this review will be coordinated with the NASA GOES Project Office. The subsequent reviews for GOES O, P, Q shall be presented as delta reviews as required from the GOES N program. Following each review, the review team members will meet with the spacecraft subsystem engineers, in one-on-one environment for detailed discussions concerning any items of interest to the review team members. The contractor will be required to provide a written response to any action item that is submitted by the review team members within the specified, agreed upon, action item response time. The review duration shall be one day, followed by not more than 2 days of in-depth follow-up discussions. (CCR 4226C, MOD 49)

Sixty days prior to the reviews, the spacecraft contractor shall prepare, coordinate and submit the agenda for the review to the NASA GOES Project Office for concurrence and/or comment. The spacecraft contractor shall then provide to NASA the review package material 14 days prior to the reviews. Dry runs to the GOES Project will be required for each review.

The spacecraft review will be held at the spacecraft contractors' facilities.

- 1. Red Team Kickoff Meeting in January 2001 to in order to orient the Red Team with the GOES N-Q program. This meeting will also be used to check off analyses (i.e. FMEA) that exist/are available in that time period.
- 2. Final review with the Red Team at the same time as the Pre-Shipment Review (Red Team Final and Pre-Shipment will be a joint review). This review will cover all assets involved with successful delivery-on-orbit.

The scope of the Red Team review activity will include the following elements:

- -Spacecraft Fully addressed
- -Payloads Fully addressed (interface accommodations for GFE, SEM in total)
- -Readiness for on orbit operations Fully addressed
- -Unique-to-mission changes to the ground station Fully addressed
- -SOMO/institutional mission operations Addressed on a mission unique requirements basis only GFE
- -Mission science operations Limited to systems needed for data capture, processing, archiving and distribution only GFE

#### Review Process Specifics:

Data must be presented that addresses (or provides) the following:

- 1. The level, competence and independence of technical peer reviews that were performed on each element and component (hardware and software).
- 2. The performance, level and independence of system level reviews that were conducted.
- 3. The level and thoroughness to which the test and verification program was implemented. The test and verification program at all levels from black box to spacecraft and integrated mission shall be detailed. This shall also include the V&V and IV&V processes used on software.
- 4. The level of mission assurance that was imposed on the implementation of the mission





- (hardware and software). This shall include parts usage as well as workmanship standards imposed. It shall also address the software assurance processes implemented.
- 5. The systems management imposed and implemented on the mission. This shall include the performance and thoroughness of analyses, requirement management, systems engineering, software metrics, configuration management, documentation and technical record-keeping and workmanship and test process management.
- 6. Factors such as staffing and the experience of the implementing organization.
- 7. Information on the failure-free as well as the total operating time on all mission critical hardware and software.
- 8. The results of the technical review process shall be detailed. It shall include an assessment of all RFA's and the Project responses to those RFA's.
- 9. The amount, level and fidelity of mission simulations and launch/operations training that was done or is planned to be done to prepare the mission for launch and on orbit operations.
- 10. Provide subsystem FMEAs and existing/available subsystem Fault Tree Analyses, and Probability Risk Assessments.
- 11. Provide mission requirements verification matrix that shows pre launch verification of the mission level requirements. This matrix shall address both the fidelity and type of verification.
- 12. Identify all single point failures and provide a subjective assessment of the probability of each such failure mode causing a mission failure. Also provide adequate rationale to substantiate the subjective assessment. (whole section, CCR 4226C, MOD 49)



#### 1.8.14 Senior NASA Management Mission Readiness Review

The data requirements for the Senior NASA Management MRR are described in CDRL LV-3.8-23.

#### 1.8.14.1 Criteria for Successful Completion

The criteria for successful completion of the Senior NASA Management MRR are as follows:

- a. Overall mission overview is described and all critical items required to proceed into final launch countdown preparations are ready.
- b. Vehicle configuration is defined and all vehicle systems have been assembled and tested per launch site test plans.
- c. Flight design and performance margins meet requirements.
- d. Launch site/range support requirements have been flowed down to implementing organizations.
- e. Tracking and data support sites are committed to support.
- f. Any open work is identified and close out plans and schedules are in place and supportable.
- g. Any constraints to launch are identified and resolution plans developed.
- h. Mission risks are known and documented.
- i. Status of launch commit criteria for spacecraft and launch vehicle is presented.





#### 1.8.15 Launch Readiness Review (LRR)

The data requirements for the LRR are described in CDRL LV-3.8-25.

#### 1.8.15.1 Criteria for Successful Completion

The criteria for successful completion of the LRR are as follows:

- a. All critical items required to proceed into final launch countdown are ready.
- b. Vehicle configuration is defined and all vehicle systems have been verified per launch site test plans.
- c. All MRR actions have been closed/resolved.
- d. Launch site/range support organizations have committed to launch.
- e. Tracking and data support sites are committed to launch.
- f. Any open work is identified and closeout plans and schedules are in place and supportable.
- g. Any constraints to launch are identified and resolution plans developed.
- h. Mission risks are known and documented.
- i. Launch commit criteria for spacecraft and launch vehicle is approved and released.
- j. Certificate of Flight Readiness is signed.



#### Agenda for GOES N-Q Software Concept Review

- 1. Briefing Overview
- 2. Management Structure
  - 2.1 GOES Organization
  - 2.2 Business Unit Organization
  - 2.3 Software Engineering Operation
  - 2.4 GOES Software Personnel
  - 2.5 SW Development History
    - 2.5.1 Flight
    - 2.5.2 SDV
    - 2.5.3 GSE
- 3. Software Subsystem Structure
  - 3.1 Architecture
  - 3.2 Preliminary Software Development Schedule
  - 3.3 Issues and Concerns
- 4. Project Management Process
  - 4.1 Requirements Flowdown
  - 4.2 Programmatic Metrics
  - 4.3 Configuration and Data Management
- 5. Flight Software
  - 5.1 Requirements Overview
  - 5.2 Operating Hardware Environment
  - 5.3 Processor Architecture
  - 5.4 Memory Architecture
  - 5.5 Space/Ground Interface
  - 5.6 Software Architecture
  - 5.7 Feasibility
    - 5.7.1 Functional Heritage
    - 5.7.2 Resource Utilization Targets
  - 5.8 Validation
  - 5.9 Process
    - 5.9.1 Process Overview
    - 5.9.2 Development Environment
    - 5.9.3 Development Tools
    - 5.9.4 Design Methodologies
    - 5.9.5 Technical Review
    - 5.9.6 Risk Assessment & Management
    - 5.9.7 Technical Metrics
- 6. SDV
  - 6.1 Requirements Overview
  - 6.2 Operating Hardware Environment
  - 6.3 Major Interfaces

- 6.4 Software Architecture
- 6.5 Feasibility
- 6.6 Validation
- 6.7 Process
  - 6.7.1 Process Overview
  - 6.7.2 Technical Review
  - 6.7.3 Technical Metrics
  - 6.7.4 Risk Assessment

#### 7. GSE

- 7.1 Requirements Overview
- 7.2 Operating Hardware Environment
- 7.3 Major Interfaces
- 7.4 Software Architecture
- 7.5 Feasibility
- 7.6 Validation
- 7.7 Process
  - 7.7.1 Process Overview
  - 7.7.2 Technical Review
  - 7.7.3 Technical Metrics
  - 7.7.4 Risk assessment
- 8. Summary
  - 8.1 Summary of standards and procedures
  - 8.2 Non-Conformance and Corrective Action Process
  - 8.3 Risk Assessment and Management
  - 8.4 Top Ten Risks
  - 8.5 Issues and Concerns
  - 8.6 Action Items

#### Attachment J

# SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN

January 12, 1998

#### **SDB PLANS**

The following Small, Small Disadvantaged and Women-Owned Subcontracting Plans are submitted in compliance with Section L.17.7.

| Plan Number            | Items Covered  |
|------------------------|--|
| SC97-04-A<br>SC97-04-B | Hughes Electronics Master Subcontracting Plan<br>GOES N, O (Basic Contract)<br>GOES P (Option 1) |
| SC97-04-C              | GOES O (Option 2)  |

Our Small Disadvantaged Business subcontracting goal is 4% of the contract value, excluding launch services, for each of these plans.



28 July 1997

TO:

Donald P. Springer

Corporate Administrative Contracting Officer Defense Contract Management District West

Los Angeles, CA

FROM:

Benita Fortner

Corporate Liaison Officer, Socioeconomic Programs

Hughes Electronics Corporation

SUBJECT:

Hughes Electronics Master Subcontracting Plan

Attached is the Hughes Electronics Master Subcontracting Plan for Fiscal Year 1998. The plan format and content remain the same as the Fiscal Year 1997 Plan.

This plan is submitted for approval for use in all government contracts that require a bcontracting plan.

Goals under the Master Subcontracting Plan will be established by each operating department for the specific contract for which the plan is being submitted. A sample attachment for individual goal projection is included as an exhibit to this plan.

Hughes remains committed to the government small disadvantaged business goal of 5% and the newly established small women owned business goal of 5%. These goal objectives will receive the utmost consideration during the establishment of individual contract goals.

cc:

Stephanie Lewis

U.S. Small Business Administration

Corporate Offices: 7200 Hughes Terrace PO Box 80028, Los Angeles CA 90080-0028 (310) 568-7200

# ANNUAL MASTER SUBCONTRACTING PLAN

#### **HUGHES ELECTRONICS CORPORATION** ANNUAL MASTER SUBCONTRACTING PLAN Small and Small Disadvantaged Business Utilization

This plan is prepared in accordance with Public Laws 95-507, 99-661, 100-180, and 100-656 and pursuant to Federal Acquisition Regulations (FAR) Subpart 19.7 and 52.219-9. The Plan is applicable to all DoD, NASA, and other Federal Government contracts entered into by Hughes Electronics Corporation (See Corporate Organization Chart Exhibit 1.) during Fiscal Year 1998.

Submitted by:

**Hughes Electronics Corporation** A subsidiary of General Motors

Master Subcontracting Plan Administrator:

Title:

Corporate Liaison Officer, Socioeconomic Programs

Location:

P.O. Box 80028 (Bldg. C01 MS B145)

Los Angeles, CA 90080-0028 Telephone: (310) 725-6118

Approval:

Approval of this Annual Master Subcontracting Plan format is evidenced

by the signature of the following authorized cognizant Government

representative.

Approved:

Donald P. Springer

Corporate Administrative Contracting Officer

**Defense Contract Management District West** 

Los Angeles, California

(310) 568-6592

This Plan format is approved for use at all Hughes Electronics facilities as listed in the attached Exhibit 2., and becomes effective for contract incorporation upon negotiation of individual subcontracting goals for utilizing Small Business (SB); Small Business Owned and Operated by Socially and Economically Disadvantaged Individuals (SDB); Historically Black Colleges and Universities (HBCU) and Minority Institutions (MI), and Small Business Owned and Operated by Willen (SWOB), in government contracts which exceed PL 95-507 thresholds.

Effective Period: 1 October 1997 through 30 September 1998.

#### HUGHES ELECTRONICS CORPORATION ANNUAL MASTER SUBCONTRACTING PLAN Small Business, Small Disadvantaged Business and Small Women Owned Business Utilization

#### TABLE of CONTENTS

| I    | Introduction  |
|------|---|
| П    | Overview  |
| Ш    | Company Policy  |
| IV   | Company-Wide Goals  |
| v    | Indirect and Overhead Costs   |
| VI   | Source Identification   |
| VП   | Socioeconomic Programs Training   |
| JII  | Implementing Actions to Develop Participation   |
| ΙX   | Record Keeping  |
| X    | Outreach  |
| XI   | Flow-Down Requirements  |
| ΧП   | Expanded Participation  |
| XIII | Master Subcontracting Plan Administrator  |
| XIV  | Socioeconomic Programs Administrators   |
| ΧV   | <ol> <li>Individual Subcontracting Plan</li> <li>Goals</li> <li>Principal Products and Proposed Sources</li> <li>Basis for Setting Goals</li> <li>Indirect and Overhead Costs</li> <li>Reports</li> </ol> |

Definitions Exhibit 1.

Exhibit 2.

Exhibit 3.

Exhibit 4.

Socioeconomic Program Administrators by facility locations
Company Socioeconomic Program Statistics
Sample Individual Subcontracting Plan

**Organization Chart** 

#### MASTER SUBCONTRACTING PLAN

#### I INTRODUCTION

The Chairman and Chief Executive Officer of Hughes Electronics Corporation, a Subsidiary of General Motors, has committed the Company's resources to further the government policy that Small Business (SB); Small Business Owned and Operated by Socially and Economically Disadvantaged Individuals (SDB); Historically Black Colleges and Universities (HBCU) and Minority Institutions (MI), and Small Business Owned and Operated by Women (SWOB), shall have the maximum practicable opportunity to compete for subcontract awards consistent with the efficient performance of all contracts.

The effectiveness of Hughes Electronics Corporation's commitment and implementation has been attested regularly by annual Socioeconomic Programs reviews conducted by cognizant military agencies, the U.S. Small Business Administration, and the Defense Contract Management Area Offices (DCMAO). Success of the Hughes program is documented in Company Statistics Exhibit 3, attached.

#### II OVERVIEW

Hughes Electronics Corporation, a large defense, space, satellite, and commercial electronics contractor, is headquartered in Los Angeles, California. Hughes Electronics is comprised of five major Companies each having multiple Business Units and /or Subsidiaries. Each of these enterprises have purchasing support co-located within their respective units. (Exhibit 2.)

Hughes Electronics is located throughout the United States with primary facilities in Arizona, California, Colorado, Washington DC, Maryland, Texas, New York, Indiana, Mississippi, Georgia, South Carolina, and Connecticut. We also have operations in Mexico, Canada and abroad.

Hughes' recognizes that SB, SDB, SWOB, and HBCU/MI concerns are a vital resource and a valuable asset to the successful performance of our programs. In this regard, Hughes' has designated a Corporate Liaison Officer (CLO), who is also the Administrator for this plan, to lead a network of Socioeconomic Programs Administrators in implementing Company Policy relative to these business concerns. Socioeconomic Programs Administrators (SPA) concentrate on maximizing business opportunities for SB, SDB, SWOB, and HBCU/MI's; participate in federal procurement counseling conferences; and investigate referrals made by the U.S. Small Business Administration. SPAs also arrange for and provide counseling services and assistance in engineering, quality, financial, procurement, and production management to these concerns. In addition to the efforts of the SPAs, Materiel Directors comprise the Source Selection Review Board, which oversees alternate source development and source selection decisions. and ensures the participation of these concerns in the competition for procurement opportunities.

# III COMPANY POLICY

Hughes Electronics' written policies, procedures and Company purchase order terms and conditions support the Company's Socioeconomic Programs (SEP) commitment and comply with the requirements of the Federal Acquisition Regulation. Included in the Company's SEP commitment are considerations for small, small disadvantaged, small women owned businesses, and Historically Black Colleges and Universities and Minority Institutions as well as labor surplus area, equal employment opportunity, employment of handicapped persons, veterans employment, environmental protection, and make-or-buy procedures. This Master Subcontracting Plan provides functional directives for Program consistency and compliance in Materiel operations and throughout the Company.

#### IV COMPANY-WIDE GOALS

The Corporate Liaison Officer, based upon past performance and projected business, and at the direction of Senior Management, allocates each Company organization an equitable share of the projected annual small, small disadvantaged, and small women owned business goals.

Frequent Corporate Materiel management reviews assure continued program effectiveness and performance against goals. During the past twenty-two years, Hughes Electronics' small business suppliers have received over \$13 billion in procurements Company-wide and captured nearly 60% of all transactions. Small disadvantaged business suppliers, since inception of the program in 1972, have received over \$1 billion in procurements.

The CLO monitors and publishes each organization's achievement based on government business data accumulated on total procurements from SB, SDB, SWOB, and HBCU/MI concerns. This consolidated information is reported on a semi annual basis to Hughes executive management and the appropriate government office of small and small disadvantaged business utilization via GSA Standard Form Number 295 or a commercial SF295 where applicable. Copies are also furnished semi annually to all cognizant plant representative offices, and to the U.S. Small Business Administration, Region IX, Los Angeles District Office.

# V INDIRECT AND OVERHEAD COSTS

Indirect and overhead purchase commitments that can be associated with government contract activity are included in the Company accumulated data. (See Section XV. Individual Subcontracting Plan - Part 4. Indirect and Overhead Costs)

# VI SOURCE IDENTIFICATION

The Company's Socioeconomic Programs Administration Network assists in identifying qualified and qualifiable SB, SDB SWOB, and HBCU/MI concerns as potential sources for participation in procurement opportunities.

# VII SOCIOECONOMIC PROGRAMS TRAINING

In-depth presentations on the requirements of Public Laws 95-507, 99-661, 100-180, and 100-656 alert all company organizations of the contractual impact of these laws. These presentations, are used throughout Hughes Electronics and serve to train management, first level supervision, stimulate buyer participation and obtain feedback on accomplishments.

# VIII IMPLEMENTING ACTIONS TO DEVELOP PARTICIPATION

A special effort is made to identify, and facilitate procurement opportunities, solicit, and fairly consider SB, SDB, SWOB and HBCU/MIs concerns for subcontracting, consistent with efficient contract performance. To this end:

- a) Solicitations, time periods for bidding, and delivery schedules are set to enable known SB, SDB, SWOB, and HBCU/MIs to compete.
- b) Requirements are reviewed for possible breakout for procurement from SB, SDB, SWOB, and HBCU/MI concerns.
- c) Make-or-buy deliberations include adequate and timely consideration of known SB, SDB, SWOB, HBCU/MI capabilities.
- d) Development work, likely to lead to production, is examined for possible placement with known SB, SDB, SWOB, and HBCU/MI concerns.
- e) Specifications, drawings, and other relevant data are made available so that qualified known SB, SDB, SWOB, and HBCU/MI concerns may equitably compete and prepare bids.
- f) To the extent possible and ethical, counseling, or other forms of assistance, is given to help known SB, SDB, SWOB, and HBCU/MIs obtain awards for which they can qualify. Supportive relationships are maintained with such suppliers.
- g) When appropriate, competition may be restricted to qualified SB, SDBs SWOB and HBCUs/MIs.

Additionally, all Company Source Selection Organizations / Teams undertake decisive efforts to identify and facilitate opportunities which enhance participation of SB, SDB and SWOB concerns to compete for procurement awards. Efforts undertaken by Source Selection Teams to solicit and fairly consider SB, SDB, SWOB, and HBCU/MIs for procurements vary among programs, commodity markets, technologies and the available industrial base. Changes in the market place or conditions which beset the Company dictate the practical alternatives available in utilizing SB, SDB, SWOB and HBCU/MI firms. The following presents options for consideration:

- a) Ensure that small business firms are considered fairly when manufacture or purchase decisions are made for components required in development or production of major subsystems.
- b) Examine development work likely to lead to production and make available specifications, drawings, and other relevant data to assist qualified SB, SDB, and SWOB firms in preparing bids.
- c) Identify sole and single source items normally procured from large businesses and ascertain the feasibility of acquiring such items from SB, SDB and SWOB concerns via alternate source development procedures.
- d) Evaluate products developed by SB, SDB and SWOB firms for possible application in systems designed and produced by the Company.
- e) Make available to inquiring SB, SDB and SWOB firms in appropriate circumstances information about Company patents so that they may evaluate the market and business potential of entering into a licensing agreements.
- f) Sponsor on-premise product displays of materials developed by small firms so that the technical community may assess future application.
- g) Consider progress or milestone payment provisions in subcontracts awarded to small concerns whenever a heavy investment is required by them in the performance of work scheduled over a prolonged period of time.
- h) Dispatch management, technical, financial, and quality assurance personnel when appropriate to assist SB, SDB and SWOB firms confronted with difficult problems that threaten their ability to perform subcontracts as an effort to avoid potential termination proceedings.
- i) When appropriate, provide Company-owned tooling and test equipment to SB, SDB and SWOB firms to enable them to perform work in accordance with engineering drawings and specifications.
- j) Assist SB, SDB and SWOB firms encountering difficulty in obtaining needed materials for the performance of subcontract work.
- k) Establish SB, SDB and SWOB business commitment award goals for buyers or organizational entities based upon goals structured and negotiated by the Corporate Liaison Officer with operating departments.
- Actively participate with the U.S. Small Business Administration and the Department of Commerce in their National Subcontractor of the Year Programs so that SB, and SDB, firms may be properly acknowledged for their contributions to defense and other federal program efforts.

### IX RECORD KEEPING

Hughes Electronics utilizes an automated classification system which, captures data, regarding solicitation, to business categories of SB, SDB, HBCU/MI, SWOB, large, foreign and nonprofit status. In addition, data is captured for sole source, single source, directed procurements, dual source and competitive awards including why awards were not made. Such information is available for all materials purchased direct to each prime contract. Materiel organizations maintain records of all awards made to these firms, and document specific efforts to identify and award subcontracts to SB, SDB, HBCU/MI and SWOB firms. The Company's computerized name and address data bank represents the status of suppliers in an on-line directory available to all procurement, finance, and quality personnel. This directory identifies each supplier as SB, SDB, HBCU/MI, SWOB, large, foreign or nonprofit and codes their characteristics as to EEO compliance, credit, quality level, and accounting system, as stated in "Source Identification", (Paragraph 4),

#### X OUTREACH

Hughes Electronics Socioeconomic Programs include extensive outreach to the SB, SDB, SWOB community. All outreach efforts are documented and include as a minimum, attendance at various federal and state sponsored procurement conferences, trade fairs, regional purchasing council membership and active support of in-plant seminars, workshops and training programs.

The CLO represents the Hughes Electronics family of companies through nationwide outreach and advocacy activities. The SPAs are trained to represent the procurement concerns and opportunities of all Hughes entities, thereby minimizing the number of SPAs required to attend any specific event; while maximizing the quantity and quality of information provided to the SB, SDB, SWOB, HBCU/MI concerns.

#### XI FLOW-DOWN REQUIREMENTS

Hughes Electronics' incorporates the required clauses in all government subcontracts which offer further subcontracting possibilities and will require all subcontractors (except small business concerns) that receive subcontracts in excess of \$1,000,000 in the case of a contract for the construction of any public facility, or in excess of \$500,000 in the case of all other contracts, to adopt a subcontracting plan similar to the one in which this section is a part. Federal Acquisition Regulation Clause 52.219-8 entitled "Utilization of Small Business Concerns and Small Disadvantaged Business Concerns" and Federal Acquisition Regulation Clause 52.219-9 entitled "Small Business and Small Disadvantaged Business Subcontracting Plan" are incorporated into Hughes Electronics "Purchase Order General Provisions and Shipping Instructions".

#### XII EXPANDED PARTICIPATION

Support of Hughes Electronics' commitment to the utilization of small, small disadvantaged small women owned business concerns and Historically Black Colleges and Universities is also demonstrated by:

- Participation in the DoD Pilot Mentor Protege Program. Hughes is currently participating in three Mentor Protege Agreements which include subcontracting opportunities, technical and developmental assistance, and technology transfer.
- HBCU/MI partnerships which include scholarships and grants, community relations programs, such as the K-12 Program which encompasses predominantly minority communities, Youth Motivation Task Force participation, and other Hughes Education & Training Projects including CalSIP and the UCLA Minority & Woman Entrepreneur Program).
- Participation in the American Bar Association and the California Bar Association's Minority Counsel program designed to promote opportunities for racial minorities in the legal profession.

Although many of these activities are not reported against the Company's goals, several million dollars have been expended on the above programs.

#### XIII MASTER SUBCONTRACTING PLAN ADMINISTRATOR

At the direction of executive management, the Corporate Liaison Officer, Ms. Benita Fortner, has responsibility for the development, implementation and management of this Company-wide annual master subcontracting plan and the Company's Socioeconomic Programs. Hughes Electronics' reserves the right to substitute another qualified individual should the need arise.

This master plan includes all subcontracting plan elements required by Public Laws 95-507, 99-661, 100-180, 100-656, and Federal Acquisition Regulation 52.219-9(d) with the exception of individual goals. The responsibility for implementation of individual subcontracting or commercial plan goals is vested in Socioeconomic Programs / Plan Administrators at the operations level.

Additionally, the duties of the Master Plan Administrator include, but are not limited to:

- a) Manage and oversee the Company-wide network of Socioeconomic Programs Administrators and provide advocacy for the Socioeconomic Programs objectives.
- b) Negotiate the annual Master Subcontracting Plan Format with the cognizant Corporate Administrative Contracting Officer and obtain concurrence from the U. S. Small Business Administration.

- c) Coordinate the development of the Company's annual SB, SDB, SWOB goals with each Materiel organization.
- d) Require all performing organizations to provide statistical reporting so that consolidated SF 295 reports are submitted in a timely manner.
- e) Represent the Company at local, state or federally sponsored procurement conferences, and associations or industry sponsored trade fairs so as to identify and counsel qualifiable SB, SDB, SWOB, capable of competing for procurement opportunities.
- f) Represent the Company, as requested, at Socioeconomic Programs reviews and interface with the reviewing agencies and performing organization to assist in resolving problem areas.
- g) Provide liaison to Government and Industry organizations relative to Company Socioeconomic Programs issues and objectives.
- h) Support the acquisition of supplier information, request supporting disciplines to obtain financial, quality, equal employment data, and ensure that such information is transmitted for inclusion in the Company Supplier Directory on an annual basis.
- i) Coordinate the annual Small Business Subcontractor of the Year Program; the National Minority Supplier of the Year Program; and other supplier recognition programs.
- j) Oversee Socioeconomic Programs Training efforts and Company participation in the Pilot Mentor/Protégé Program and the Small Business Innovative Research Program
- k) Advise Executive and Group Management of any matter that could impair accomplishment of actions specified in this master subcontracting plan or individual subcontracting plans.

#### XIV SOCIOECONOMIC PROGRAMS ADMINISTRATORS

Responsibility for the implementation and administration of this master subcontracting plan and the Company's Socioeconomic Programs at the Operation level is vested in the network of Socioeconomic Programs Administrators (SPAs).

Socioeconomic Programs Offices provide overall guidance and support to total Company efforts enhancing the utilization of SB, SDB, SWOB and HBCU/MI concerns. for a complete list of SPAs, please see Exhibit 2 attached.

- e duties of Socioeconomic Programs Administrators shall include, but not be limited to, the following:
  - a) Attend procurement counseling conferences sponsored by government, chambers of commerce, and trade associations upon request from the Corporate Liaison Officer as a means of developing and counseling SB, SDB, and SWOB sources.
  - b) Provide advocacy assistance for all small firms interested in doing business with Hughes Electronics.
  - c) Provide counseling services to small firms visiting Materiel organizations to ensure their understanding of the Hughes procurement system. Aid such concerns in competing for purchase awards by locating technical, management, quality, material and/or financial assistance.
  - d) Undertake actions to coordinate individual subcontracting plans prior to submission. Ensure Company and individual subcontracting plan procurement goals are communicated throughout respective organizations and that good faith efforts toward meeting those goals are executed.
  - e) Prepare and submit; program reports to the Corporate Liaison Officer and to the cognizant government agencies; SF 294's in accordance with the instructions printed on the Standard Form; Commercial plan SF 295's in accordance with the instructions printed on the Standard Form, and other program information as requested by the CLO and Customer.
  - f) Provide liaison between Materiel Organizations, Program Management and Commodity Directors, including participation on Source Selection Teams to ensure socioeconomic concerns are met.
  - g) Conduct training sessions to ensure that appropriate personnel are aware of federal requirements and that they take necessary actions to ensure SB, SDB, SWOB, and HBCU/MI's are afforded an equitable opportunity to compete.
  - h) Manage Mentor Protege participation at the operation level and aid management in structuring and formulating SB, SDB, SWOB and HBCU/MI subcontracting goals.
  - i) Bring to Materiel management's attention any matter that could impair the effectiveness of Company policy regarding the Socioeconomic Programs or individual subcontracting plans.

#### XV INDIVIDUAL SUBCONTRACTING PLAN

#### 1. GOALS

a) Individual goals for the utilization of small business concerns, small business concerns owned and operated by social and economically disadvantaged individuals, and small business concerns

- owned and operated by women expressed as a percent of total dollars planned to be subcontracted for a specific applicable contract, will be negotiated and separately presented at the time of said contract. SDB goals will include HBCUs and MI's participation.
- b) It is hereby agreed that goals for each individual contract will be negotiated and presented to include applicable dollars and percents for the following:
  - Total planned dollars to be subcontracted domestically
  - Total dollars anticipated to small business
- c) And, as a subset of anticipated small business subcontracting, separate goals will be identified for the groups below:
  - Small Disadvantaged Business which includes Historical Black Colleges or Universities and Minority Institutions and
  - Small Business Concerns owned and operated by Women (if required)

#### 2. PRINCIPAL PRODUCTS AND PROPOSED SOURCES

Each contract, requiring subcontract goals, will include an appendix describing the principle supplies and services anticipated to be subcontracted under the specific contract. This appendix shall identify the type of business concern that may reasonably be expected to participate in this subcontracting effort.

#### 3. BASIS FOR SETTING GOALS

It is the policy of Hughes Electronics to base subcontracting plan goals on total volume of planned domestic subcontracting for each applicable contract while considering complexity and security constraints. This effort includes screening the bills of material to evaluate which major item procurements, complex articles, and components are suitable to be procured from SB, SDB, SWOB concerns, and HBCUs/MIs. A best effort will be made to use, whenever feasible, the Historically Black Colleges or Universities (HBCUs) and Minority Institutions (MIs). This will be accomplished by considering whether subcontracts which are contemplated will involve research or studies of the type normally performed by higher educational institutions. These dollars will be listed as a stand alone goal and included in the Total Small Disadvantaged Business goal. (See goals portion of the plan.) Initial action for the development of the subcontracting plan goals begins during the proposal phase of a program and close coordination is required between Contracts and Material functions to ensure that negotiated goals are realistic and achievable.

# INDIRECT AND OVERHEAD COSTS

compliance with this subcontracting plan.

#### 5. REPORTS

Hughes Electronics will, in accordance with the general instructions of GSA Standard Form 294 (1-90) and in compliance with Paragraph (d)(10) of Federal Acquisition Regulation Clause 52.219-9, prepare and submit reports on Standard Form 294 for each contract that exceeds the reporting requirement threshold. Each Standard Form 294 report will cover a six month period ending 31 March and 30 September and a final report will be submitted upon contract completion to the Administrative Contracting Officer. Each report will be submitted by the 30th day following the close of the reporting period unless otherwise directed by the contracting officer. Further, Hughes Electronics agrees to cooperate in any studies or surveys as may be required by the contracting agency or the U.S. Small Business Administration in order to determine

#### **DEFINITIONS**

Affiliates: Business concerns are defined as affiliates if, directly or indirectly, either one controls or has the power to control the other; or another concern controls or has the power to control both. This includes common ownership, common management, and contractual relationships. Any business entity may be found to be an affiliate, whether or not it is organized for profit or located in the United States.

Annual Receipts means gross income of a concern and its domestic and foreign affiliates from sales of products and services and/or interest, rent, fees, and commissions from whatever other source derived for its most recently completed fiscal year, less returns, allowances, sales of fixed assets, and inter-affiliate transactions.

Average Annual Receipts mean, for the purpose of size standards, annual receipts averaged over three continuous years. For a concern in business less than three years, they are computed by determining average weekly receipts for the period in which it has been in business, multiplying by 52.

Company percentage goals are structured using all purchased materials and services whether direct or indirect in nature. Such goals are calculated and apportioned to operating organizations on an annual basis by the Corporate Liaison Officer and have no bearing on a specific customer contract.

Contractual percentage goals are structured using only identifiable materials and services which are chargeable directly to a specific customer contract or higher-tier subcontract. Normally, contractual goals represent a smaller percentage than Company goals because calculations exclude indirect materials, capital items, and inventoried materials.

Controlled is defined as exercising the power to make policy decisions.

Disadvantaged means a small, domestic concern which, including domestic and foreign divisions, subsidiaries, and affiliates, is at least 51 per cent owned by one or more socially and economically disadvantaged individuals; or in the case of a publicly-owned business, at least 51 per cent of the stock is owned by one or more such individuals, and whose management and daily business operations are controlled by one or more such individuals. Socially and economically disadvantaged individuals include Black Americans who are U.S. citizens; Hispanic Americans who are U.S. citizens and whose ancestry and culture are rooted in South America, Central America, Mexico, Cuba, the Dominican Republic, Puerto Rico. Spain or Portugal; Native Americans i.e. American Indians, Eskimos, Aleuts or Native Hawaiians; Asian Pacific Americans who are U.S. citizens whose origins are from Japan, China, The Philippines, Vietnam, Korea, Samoa, Guam, U.S. Trust Territory or the Pacific Islands, Northern Mariana Islands, Laos, Cambodia, or Taiwan; Subcontinent Asian Americans (formerly Asian Indian Americans) who are U.S. citizens whose origins are from India, Pakistan, Bangladesh, or Sri-Lanka; and any other individual/concern currently certified for participation in the Section 8 (a) Small Business Administration Program.

<u>Foreign</u> means any concern whose principal base of operation is located outside the 50 United States, its territories, and possessions.

Historically Black Colleges and Universities (HBCU) means institutions determined by the Secretary of Education to meet the requirements of 34 Code of Federal Regulations (CFR) Section 608.2. Must be a college or university established for black education and not as a result of changing demographics.

Large means any business concern not categorized as "Small" in 13 CFR Section 121, Small Business Size Standards.

Minority Institutions (MIs) means institutions meeting the requirements of 34 CFR Section 607.2. This also includes any non-profit research institution that was an integral part of an HBCU before 14 November 1986.

Non-Profit means any organization not conducted or maintained for the purpose of making a profit. Included in this category are: sheltered workshops, universities, colleges, and local, state, and Federal governments.

Operated is defined as actively involved in day-to-day management. Publicly-owned businesses, joint stock associations, and business trusts are exempt from this definition.

Plan Administrator (PA) is the individual responsible for the implementation and administration of the Subcontracting Plan. The name of the PA appears on the cover sheet of the Individual Goals sections of the Plan. The duties of the PA are set forth on the third and fourth pages of the individual Goals section of the plan.

SIC Code is Suppliers Industrial Classification per 13 CFR Part 121. Small Business Size Standards.

<u>Small</u> means a domestic firm, including its affiliates, that is independently owned and operated, is not dominant in its field, and has been categorized by the United States Small Business Administration as "Small" in accordance with 13 CFR Part 121. Small Business Size Standards.

Socioeconomic Programs Administrator (SPA) is the individual appointed by Group. Division, or major organization Management to provide overall guidance and support of Company efforts to enhance the utilization of small business concerns, small business concerns owned and controlled by socially and economically disadvantaged individuals, and woman-owned concerns in the performance of Company-held Government contracts.

<u>Subcontract</u> is any agreement entered into by a prime contractor or subcontractor for materials, supplies or services, other than personal in nature, required to support the performance of a U.S. Government contract.



Woman-owned means a small, domestic concern which, including domestic and foreign divisions, subsidiaries, and affiliates, is at least 51 per cent owned, controlled, and operated by a woman or women, and is not dominant in its field of operation.

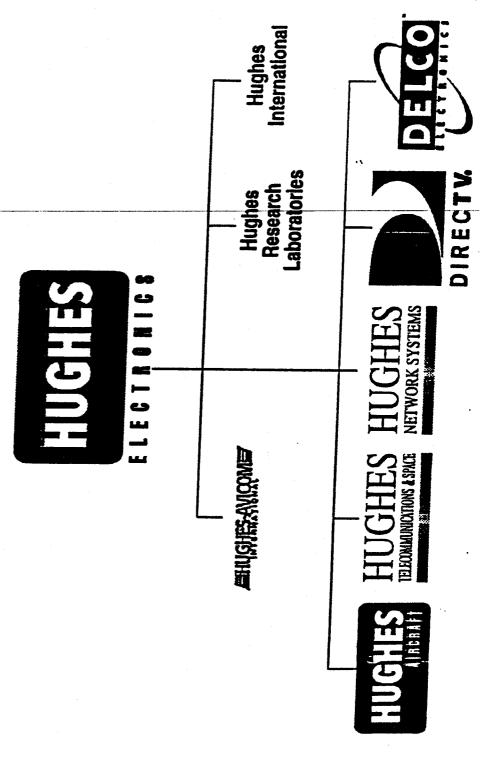


Exhibit 1

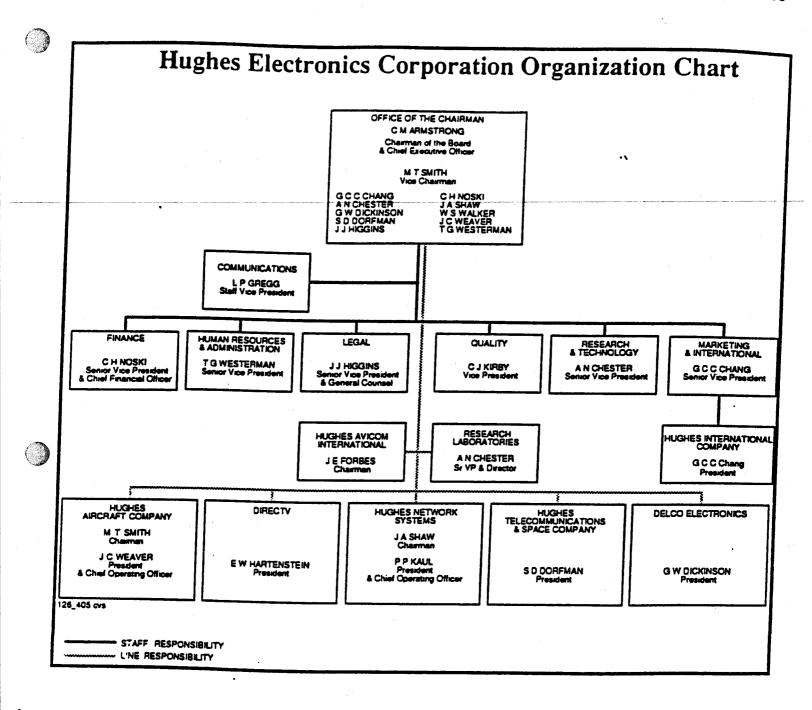


Exhibit 1

Exhibit 2

#### HUGHES ELECTRONICS CORPORATION

-SOCIOECONOMIC PROGRAMS-CONTACT POINTS- (8/97)

Hughes' Electronics has established a Company-wide network of Socioeconomic Program Administrators (SPAs) to assist small, small disadvantaged and woman-owned firms in becoming acquainted with Company procurement requirements. Those SPA's are listed below by the Facility they service.

#### **CORPORATE**

Corporate Liaison Officer
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Los Angeles, CA 90080-0028

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## HUGHES TELECOMMUNICATIONS AND SPACE COMPANY

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#### **HUGHES NETWORK SYSTEMS**

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#### HUGHES AIRCRAFT COMPANY

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Dave Fournier
(203) 797-5909

(203) 797-5909 fax: (203) 797-5113 Charles Hooker (706) 883-4058 fax: (706) 883-4284

Hughes Danbury Optic Systems, Inc. 100 Wooster Height Road Danbury. CT 068 1 0 Hughes Georgia. Inc. 1302 Orchard Hill Road LaGrange. GA 30240 Santa Barbara Research Center Goleta, CA 93117

Hughes Aircraft - South Carolina P.O. Box 1163 Orangeburg, SC 29115 Hughes Defense Communications 1010 Production Road Fort Wayne, IN 46808 Hughes Aircraft Mississippi, Inc. Route 5, Box 9 Forest, MS 39074

Weapons Systems Segment
Missile Systems Company
P.O. Box 11337
Tucson, AZ 85734

Naval and Maritime Systems P.O. Box 3310 Fullerton. CA 92634 6500 Harbor Heights Parkway Mukilteo. WA 98275-4862 Hughes Data Systems 2362 McGaw Irvine, CA 92713

Hughes Information Systems
Hughes Information Technology Company
16800 E. Centre Tech Parkway
Aurora, CO 80011-9046

Hughes Electronic Technologies
1230 Rosecrans Avenue
Manhattan Beach, CA 90266-2416
Hughes Technical Services Corporation
P.O. Box 9399
Long Beach, CA 90810
Hughes Technical Services Indiana
6125 E. 21<sup>51</sup> Street
Indianapolis, IN 46219-2058
Command and Control Systems
Fullerton, CA 92634

Bud Spain
Bldg. E01. MS C103
(310)616-7363/616Helen Westmoreland
Bldg. E4. MS N120
(310) 616-7498/616-0755(fax)
Marie McLean-Choi
(803) 531-7919
fax: (803) 531-7990
Ed Collins
(219) 429-5705
(219) 429-7755(fax)
Hertis L. Ross
(601) 469-3730 x429
fax: (601) 469-3778

Stephen A. Villaescusa
Bldg. M30, MS R22
(520) 663-7828/663-7874(fax)
JoAnne Arvizu
(520) 663-7711
Eileen Copeland
Bldg. 604 MS F107
(714) 732-5748/732-5717(fax)
Anthony E Forrest
(425)356-3119/356-3056(fax)
Beth Edgell
Bldg. 708, MS A100
(714) 253-8850/724-0753(fax)

Donna Von Biela
Bldg. 485. MS 5M82
(303) 306-8348
fax: (303) 306-5480
Stan Lenci
(310) 536-6581
fax: (310) 536-6568
Shirley Patterson
Bldg. E1. MS E180
(310) 416-2560
Connie F. Spillers
MS 45
(317) 290-4066
Donna Von Biela
(303)8348/306-8480(fax)

Hughes STX Corporation 4400 Forbes Blvd. Lanham. MD 20706 Hughes Training, Inc. 621 Six Flags Drive Arlington, TX 76011 13775 McLearen Road Herndon, VA 22071

Hughes Training, Inc. 2224 Bay Area Blvd Houston, TX 77058 6341 East Campus Circle Drive Irving, TX 75063

HUGHES DEFENSE SYSTEMS
Hughes Defense Systems

P.O. Box 902 El Segundo, CA 90245-0902

DIRECTV DIRECTV

P.O. Box 92426 Los Angeles, CA 90009

HUGHES COMMUNICATION INC.

Hughes Communication Inc. 1900 E. Grand Avenue El Segundo, CA 90245

HUGHES POWER CONTROL SYSTEMS
P.O. Box 2930
3050 Lomita Blvd
Torrance, CA 90509-2923

AUTOMOTIVE ELECTRONICS DEVELOPMENT (AED)

3011 Malibu Canyon Road Malibu. CA 90265 Karin Elliott (301) 794-5179 fax: (301) 459-0097 Ty Hendricks Bldg. A39 MS 304

(817) 695-3868/695-3866(fax)

Stokes B. Hill

(703) 481-4738/689-2496(fax)

Cameronn H. Guthier (713) 280-4158 fax: (713) 280-4555

Erin Pfarner

(214) 753-7121/753-7027(fax)

Shirley Patterson Bldg. E1. MS E180 (310) 416-2560

Chip Henderson (310) 535-5292 Bldg. R8. MS N345

TBD

(310) 607-4000

(310) 517-5712

(310) 317-5439

# HUGHES ELECTRONICS CORPORATION SMALL BUSINESS STATISTICS FISCAL YEAR 1973 TO 1996

|      | SMALL BU        | SINESS  | DISADVANTACED        |         | DISADVANTAGED        |             | TT/OD4 A DI | <b>*</b> |
|------|-----------------|---------|----------------------|---------|----------------------|-------------|-------------|----------|
| YEAR | DOLLARS.        |         |                      |         | WOMAN-               | OWNED.      |             |          |
|      | DULLAR DULLAR   | DOLLARS | RATIO                | DOLLARS | RATIO                |             |             |          |
| 1996 | \$633,382,345   | . 38%   | \$126.641.102        |         |                      |             |             |          |
| 1995 | \$782,944,732   | 41%     | \$126,641,183        | 7.57%   | <b>\$</b> 34,303,504 | 2.05%       |             |          |
| 1994 | \$784,529,379   | 36%     | \$175,064,151        | 9.20%   | \$34,132,606         | 1.77%       |             |          |
| 1993 | \$777,463,363   | 36%     | \$118,225,529        | 5.40%   | \$37,471,621         | 1.70%       |             |          |
| 1992 | \$450,741,082   | 39%     | \$105,063,622        | 4.80%   | <b>\$</b> 34,258,458 | 1.50%       |             |          |
| 1991 | \$693,101,070   | 42%     | \$49,943,984         | 4.40%   | \$20,543,471         | 1.80%       |             |          |
| 1990 | \$683,935,332   | 42%     | \$59,667,924         | 3.60%   | \$34,656,651         | 2.20%       |             |          |
| 1989 | \$801,791,140   |         | \$51,855,896         | 3.20%   | \$38,131,383         | 2.30%       |             |          |
| 1988 | \$864,058,000   | 43%     | \$52,074,500         | 2.70%   | \$42,247,927         | 2.20%       |             |          |
| 1987 | \$968,884,108   | 45%     | \$40,451,000         | 2.10%   | \$32,552,408         | 1.70%       |             |          |
| 1986 | \$1,115,450,190 | 46%     | \$53,840,640         | 2.60%   | \$44,530,826         | 2.10%       |             |          |
| 1985 | \$996,147,576   | 51%     | \$76,446,260         | 3.50%   | \$41,336,803         |             |             |          |
| 1984 |                 | 46%     | <b>\$</b> 66,154,050 | 3.00%   | <b>\$</b> 35,554,233 | 1.90%       |             |          |
| 1983 | \$889,864,006   | 46%     | \$54,809,696         | 2.80%   | <b>\$31.887.623</b>  | 1.60%       |             |          |
| 1982 | \$792,123,788   | 48%     | \$44.367,164         | 2.60%   | \$25,6930\$13        | 1.60%       |             |          |
| 1981 | \$672,213,744   | 45%     | \$37,661,697         | 2.50%   | \$17,590,043         | 1.50%       |             |          |
| 1980 | \$583,074,811   | 47%     | \$40,589,358         | 3.30%   |                      | 1.20%       |             |          |
| 1979 | \$472,300,000   | 66%     | \$35,100,000         | 5.00%   | \$10,028,612         | 0.80%       |             |          |
|      | \$382,400,000   | 47%     | \$23,700,000         | 2.90%   | \$1,200,000          | 0.07%       |             |          |
| 1978 | \$260,000,000   | 42%     | \$17,000,000         | 2.70%   |                      |             |             |          |
| 1977 | \$194,000,000   | 39%     | \$12,000,000         |         |                      |             |             |          |
| 1976 | \$213,000,000   | 38%     | \$5,100,000          | 2.40%   |                      |             |             |          |
| 1975 | \$199,000,000   | 40%     |                      | 0.90%   |                      | <b>&gt;</b> |             |          |
| 1974 | \$189,000,000   | 41%     | \$5,000,000          | 0.90%   |                      |             |             |          |
| 1973 | \$149,000,000   | 40%     | \$4,800,000          | 1.00%   |                      |             |             |          |
|      | 41.7,000,000    | 4070    | \$3,500,000          | 0.90%   |                      |             |             |          |

WOMAN-OWNED NOT RECORDED PRIOR TO 1980.

| HE Group/Division Name:   |   | Exhibit   |
|---|---|---|
| Date:   | Contract/RFP No:  |   |
| Plan No:  | HAC Ref. No.:   |   |
| Modification No.:   |   | ••  |
|   |   | •   |
| MA<br>APP   | IVIDUAL SUBCONTRAC<br>STER SUBCONTRACTIN<br>ROVED FOR USE DURIN<br>TRATIVE CONTRACTIN<br>FOR THE UTILIZ | IG PLAN HEMSP96-97<br>IG FISCAL YEAR 1998<br>IG OFFICER D.P. SPRINGER, DCMDW-CACO                         |
| <ul> <li>Small Business Concerns</li> <li>Small Disadvantaged Busin</li> <li>Small Women Owned Busin</li> </ul> | ess Concerns<br>ness Concerns   | <ul> <li>Historically Black Colleges,</li> <li>Universities and Minority</li> <li>Institutions</li> </ul> |
| Submitted By: Group Address City. State   | ;<br>-<br>-   | HUGHES ELECTRONICS CORPORATION  |
| Fian Administrator: Title Location  |   |   |
| Telephone   |   |   |
| Socioeconomic Programs Administration   | trator:   | •   |
| Location<br>Telephone   |   |   |
| Contract Administrator: Title Location Telephone  |   |   |
| Principal Contracting Officer: Agency Address   |   |   |
| Telephone   |   |   |
| Administrative Contracting Officer Agency Address Telephone   |   |   |
| reichnone   |   |   |

| HE Group/Division Name:      |                  |    |   | Exhibit 4 |
|------------------------------|------------------|----|---|-----------|
| Date:                        | _ Contract/RFP N | o: |   |           |
| Plan No:                     | _ HAC Ref. No.:  |    |   |           |
| Modification No.:            |                  |    |   |           |
| 1. CONTRACT INFORMATIO       | N                |    | • |           |
| Contract/RFP No.             |                  |    |   |           |
| Description                  |                  |    |   |           |
| Period of Performance        |                  |    |   |           |
| Effective Date of Contract   | word/blooming    |    |   |           |
| Change No.                   | Date:            |    |   |           |
| 2. <u>VALUES</u>             |                  |    |   |           |
| Total Current Contract Value |                  | \$ |   |           |
| Planned Subcontract Dollars  |                  | s  |   | 100%      |
| Domestic Subcontract Dollar  | S                | S  |   | 100%      |

#### 3. GOALS

For the purpose of this individual subcontracting plan, the following separate percentage goals are hereby expressed in terms of a percentage of the total planned domestic subcontract dollars. The goal for small disadvantaged business concerns includes consideration of Historically Black Colleges and Universities and Minority Institutions in a composite SDBs, HBCUs, and MIs Goal, and while stated separately as a percentage of planned subcontract dollars, is included in the goal for small business concerns and constitutes a subset thereof. Goals for Small Business Concerns owned and operated by Woman or Women, if required as part of this subcontracting plan will be stated separately; but, will be included in the goal for small business concerns and constitutes a subset thereof. These planned subcontract dollars included all first tier subcontracts to be awarded in the performance of this contract but unless specifically an separately stated as stand-alone items do not include the cost of any products or services normally allocated as indirect or overhead.

The Hughes Electronics Corporation hereby commits to continue applying its organized and proven resources in carrying out the government's socioeconomic program objectives and hereby agrees to strive for achievement of the following goals:

| Date                                      | <b>.</b>   | Communication             | ·   |   |
|---|--|---------------------------|---|---|
|   |  | Contract/RFP No:          |   |   |
| Plan                                      | No:  | HAC Ref. No.:             |   |   |
| 3.  | a) <u>Individual Goals</u>   |                           |   |   |
| er - spennenss generalis en eus rigeres ; | PLANNED SUBCONTRAC   | T BASE:                   | AMOUNT  | PERCENT   |
|   | i. Total Dollars   |                           | S   | 100 9   |
|   | 2. To Large Business   |                           | \$  | 9   |
|   | 3. To Small Business   |                           | \$  | 9   |
|   | SMALL BUSINESS SUBSE   | ETS:                      | AMOUNT  | PERCENT OF ITEM                                 |
|   | 4. Disadvantaged   |                           | e   | TOTAL   |
| •   | 5. HBCUs/MIs   |                           | <u> </u>  | %<br>%  |
|   | 6. Woman-Owned   |                           | <u> </u>  | <del>***</del>                                  |
|   |  |                           |   |   |
|   | 7. Non-disadvantaged   | ems 4 & 5 when combin     | S   | %   |
|   | 7. Non-disadvantaged  Justification is required for ite  | ems 4 & 5 when combin     | Sned percentages are less than 5  | %   |
|   | 7. Non-disadvantaged  Justification is required for ite  | ems 4 & 5 when combin     | \$ned percentages are less than 5   | <u> </u>  |
|   | 7. Non-disadvantaged  Justification is required for ite  | ems 4 & 5 when combin     | s   | <u> </u>  |
|   | 7. Non-disadvantaged  Justification is required for ite  | ems 4 & 5 when combin     | \$  | <u> </u>  |
|   | 7. Non-disadvantaged  Justification is required for ite  | ems 4 & 5 when combin     | S   | %   |
| 4. <u>M</u>                               | 7. Non-disadvantaged  Justification is required for ite  | ems 4 & 5 when combin     | s   | %   |
| Up<br>cor<br>ref                          | 7. Non-disadvantaged  Justification is required for ite brief explanation is required.   | is contract exceeding the | he \$500,000 threshold, (\$1,000  | %. If item 5 is zero a  0.000 for contract goal |
| Up<br>cor<br>ref<br>thre                  | Justification is required for ite brief explanation is required.  DDIFICATIONS  on receipt of a modification to the astruction). Hughes will promptly lecting those changes. The followeshold. | is contract exceeding the | he \$500,000 threshold, (\$1.000 evisions to the appropriate sub only to contract modifications | %. If item 5 is zero a  0.000 for contract goal |

|   | •   |   |   | F-19.  |
|---|---|---|---|--|
| HE Group/Division Name:   | ***   |   |   | Exhibit 4  |
| Date:   | Contract/RFP No:  |   |   |  |
| Plan No:  | HE Ref. No.:  |   |   |  |
| 4. MODIFICATIONS (continu   | ed)   |   |   |  |
| PLANNED SUBCONTRACT B   | ASE: FROM   |   | TO  | minerally reference to the last and a second of participation of the par |
| 1. Total Dollars  | <b>S</b>  | 100 %   | <b>S</b>                                    | 100 %  |
| 2. To Large Business  | S   | <u> </u>  | S   | %  |
| 3. To Small Business  | . S   | <u> </u>  | \$  | %  |
| SMALL BUSINESS SUBSETS:   |   |   |   |  |
| 4. Disadvantaged  | S   | %   | s   | %  |
| 5. HBCUs/MIs  | S   | %   | s   | %  |
| 6. Woman-Owned  | \$  | %   | S   | %  |
| 7. Non-Disadvantaged  | \$  | <u> </u>  | \$  | %  |
| 5. TECHNICAL ASSISTANCE   | E TO SDB CONCERNS   |   |   |  |
| Setting Goals": paragraph 4 " Participation": and paragraph undertaken to aid SDB conce | escribed in the Annual Subcontra<br>Source Identification"; paragraph<br>11 "Record keeping and Outread<br>ms receive an opportunity to part<br>he achievement of the above state | n 8 "Implementing A<br>th Effort", the follow<br>ticipate in the perfor | Actions to Develop<br>ving specific efforts | will be  |
|   |   |   |   |  |
|   |   |   |   |  |
|   |   |   |   |  |
| 6. PRINCIPAL PRODUCTS AN  | ID SERVICE AREAS  |   |   |  |
| Appendix I attached hereto con  | ,<br>ntains a description of the princip  | oal supply and service  | e areas scheduled to                        | o be   |

subcontracted and identification of those areas anticipated to be subcontracted to small business concerns, small business concerns owned and operated by socially and economically disadvantaged individuals and large business concerns.

#### 7. PLAN ADMINISTRATOR

Responsibility for the implementation and administration of this subcontracting plan is vested in the responsible Plan Administrator whose name appears on the cover sheet. Hughes reserves the right to substitute another qualified individual as Plan Administrator should the need arise. The duties of the Plan Administrator shall include but not be limited to the following:

| HE Group/Division Name: |                  | E.  | xhibit 4 |
|-------------------------|------------------|---|----------|
| Date:                   | Contract/RFP No: | 48-88-34-34-34-34-34-34-34-34-34-34-34-34-34- |          |
| Plan No:                | HAC Ref. No.:    |   |          |

#### 7. PLAN ADMINISTRATOR (continued)

- a) Prepare small business subcontracting plans which include percentage goals, a description of efforts facilitating SB and SDB participation, assurances that subcontracts contain flow-down provisions, agreement to submit reports and a recitation of records maintained including small business source lists.
- b) Require all Materiel organizations designated to perform work under the Company contract to provide total estimated procurement dollars to be let via assist work authorizations including the estimated amount targeted for large, small and small disadvantaged business concerns.
- c) Structure percentage goals for inclusion in the subcontracting plan using identifiable subcontract materials in the development of such goals, communicate such goals to procurement personnel and require supporting Groups and Divisions to maintain records of solicitations and awards and to submit performance reports against established goals so that information may be fed back to the government.
- d). Assure Materiel contract briefs disclose terms and conditions of the Company contract concerning small business plans including provisions for incentive award fees and reporting requirements and make certain that such briefs are distributed to all performing organizations.
- e) Make sure during Make-or-Buy Board meetings that SB and SDB capabilities are adequately considered and that such firms are listed as potential sources on the make-or-buy plan.
- f) Review bills of material to determine economic ordering quantities suitable for procurement from SB and SDB and examine program work breakdown structures to determine alternative ways in which material and services may be acquired from SB and SDB concerns.
- g) Coordinate with Group/Divisional SPAs prior to subcontract plan submission to develop listings of prospective SB and SDB bidders that are capable of performing work for known procurements and set time periods for bidding and delivery schedules to enable them to compete.
- h) Advocate SB and SDB interests during Procurement Review Committee meetings to ensure that small firms are equitably considered during the source selection process. Maintain and evaluate records of small disadvantaged business and HBCU/MI solicitation responses to assist in determining ability to compete.
- Bring to Materiel. Contracts and Program Management's attention any matter that could impair accomplishment of actions specified in subcontracting plans which might adversely affect the Company contracts.

| HE Group/Division Name: |                  |   | · . |
|-------------------------|------------------|---|-----|
| Date:                   | Contract/RFP No: |   |     |
| Plan No:                | HE Ref. No.:     | 4 |     |
| •                       |                  |   |     |

#### APPENDIX I

# PRINCIPAL PRODUCTS AND SERVICE AREAS BY BUSINESS SIZE CATEGORIES

Hughes Electronics Corporation, relative to the above Contract/RFP, anticipates procurement of the following listed products and services from the following categories of business concerns:

| 1  |  |  |       | ALL | ALL SMALL BUSINESS CONCERNS |               |      |    |  |
|--|--|--|-------|-----|-----------------------------|---------------|------|----|--|
| PRODUCT/SERVICE                              |  |  |       | İ   |                             | DISADVANTAGED |      |    |  |
| <u> </u>                                     |  |  | LARGE | SB  | WOB                         | SDB           | HBCU | MI |  |
| <u>)                                    </u> |  |  |       |     |                             |               |      |    |  |
| 2.   |  |  |       |     |                             |               |      |    |  |
| 3.   |  |  |       |     |                             |               |      |    |  |
| 4.   |  |  |       |     |                             |               |      |    |  |
|  |  |  |       |     |                             |               | .    | •  |  |
| 5.   |  |  |       | ,   |                             |               |      |    |  |
| 6.   |  |  |       |     |                             |               |      |    |  |
| 7.   |  |  |       |     |                             |               |      |    |  |
| 8.   |  |  |       |     |                             |               |      |    |  |
| 9.   |  |  |       |     |                             |               |      |    |  |
|  |  |  |       | ·   |                             |               |      |    |  |
| 10.  |  |  | •     |     |                             |               |      |    |  |

NOTE: USE A CONTINUATION SHEET FOR ITEMS OVER TEN

Legend:

)= Small Business

SDB = Small Disadvantaged Business

MI = Minority Institution

WOB = Women-Owned Business

HBCU = Historically Black College or University

SDB PLAN NO. SC97-04-A (GOES N & O)

| HE Organization Name:   | Hughes Space and (                              | Exhibit 4 Communications Company  |
|---|---|---|
| Date: 01/12/98  | Contract/RFP No:                                | RFP5-02520/427  |
| Plan No: SC97-04-A  | HAC Ref. No.:                                   | L0226   |
| Modification No.:   |   | ,   |
| MASTER APPROVE BY CORPORATE ADMIN   | SUBCONTRACTI<br>D FOR USE DURI<br>ISTRATIVE CON | -<br>CTING GOALS UNDER<br>NG PLAN HEMSP97-98<br>NG FISCAL YEAR 1998<br>FRACTING OFFICER D.P. SPRINGER,<br>E UTILIZATION OF: |
| <ul> <li>Small Business Concerns</li> <li>Small Disadvantaged Business</li> <li>Small Women Owned Business</li> </ul> | iness Concerns                                  | <ul> <li>Historically Black Colleges,</li> <li>Universities and Minority</li> <li>Institutions</li> </ul>                   |
| Submitted By: Group Address City, State   | Hugl<br>2260                                    | GHES ELECTRONICS CORPORATION nes Space and Communications Company E. Imperial Highway egundo, California 90245              |
| Plan Administrator: Title Location Telephone  | Mark<br>Subc<br>SC/S                            | A. Burris contract Manager 10/S382 416-2291   |
| Socioeconomic Programs Admi<br>Name<br>Location<br>Telephone  | nistrator:  Louis  SC/S                         | e Erickson<br>41/A345<br>364-6067   |
| Contract Administrator: Title Location Telephone  | Mana<br>SC/S4                                   | ger, NASA Contracts 1/A370 416-4244   |
| Principal Contracting Officer: Agency Address Telephone   | NASA<br>Green                                   | a Marshall a Goddard Space Flight Center belt, MD 20771 286-4472  |
| Administrative Contracting Offic<br>Agency<br>Address   | Defens<br>c/o Hu                                | nn Harrington se Contract Management Command ghes Aircraft Company, Los Angeles, CA 1/M306                                  |
| Telephone   | (310) 3   | 64-6472   |

| HE Organization Name:                      | Hughes S   | pace and ( | Communicatio  | ons Company | Exhibit 4 |
|--|------------|------------|---------------|-------------|-----------|
| Date: 01/12/98                             | Contract/  | RFP No:    | RFP5-0252     | 0/427       |           |
| Plan No: SC97-04-A                         | HAC Ref    | No.:       | L0226         |             |           |
| Modification No.:                          |            | ·          | -             |             |           |
| 1. CONTRACT INFORMAT<br>Contract/RFP No.   | <u>ION</u> | RFP5-0     | 2520/427      |             |           |
| Description                                |            | GOES       | N, O (Basic C | ontract)    |           |
| Period of Performance                      |            | 2/01/98    | - 4/30/04     |             |           |
| Effective Date of Contract                 | :t         | ·          |               |             |           |
| Change No.                                 | Date:      |            |               | ····        |           |
| 2. <u>VALUES</u> Total Current Contract Va | alue       | \$ _       |               | 423,100,000 |           |
| Planned Subcontract Doll                   | ars        | \$         |               | 243,549,000 | 100.0%    |

#### 3. GOALS

Planned Domestic Subcontract Dollars

For the purpose of this individual subcontracting plan, the following separate percentage goals are hereby expressed in terms of a percentage of total planned domestic subcontract The goal for small disadvantaged business concerns includes consideration of Historically Black Colleges and Universities and Minority Institutions in a composite SDBs, HBCUs, and MIs Goal, and while stated separately as a percentage of planned subcontract dollars, is included in the goal for small business concerns and constitutes a subset thereof. Goals for Small Business Concerns owned and operated by Woman or Women, if required as part of this subcontracting plan will be stated separately; but, will be included in the goal for small business concerns and constitutes a subset thereof. These planned subcontract dollars included all first tier subcontracts to be awarded in the performance of this contract but unless specifically and separately stated as stand-alone items do not include the cost of any products or services normally allocated as indirect or overhead.

99.1%

241,349,000

The Hughes Electronics Corporation hereby commits to continue applying its organized and proven resources in carrying out the government's socioeconomic program objectives and hereby agrees to strive for achievement of the following goal

| 112 (              | Organization Name:  | Hughes Space and   | Communications Company   | у   |
|--------------------|---|--|--|---|
| Date:              | 01/12/98  | Contract/RFP No:   | RFP5-02520/427   |   |
| Plan               | No: SC97-04-A   | HAC Ref. No.:  | L0226  |   |
| 3. a)              | Individual Goals  |  |  |   |
|                    | PLANNED SUBCO   | NTRACT BASE:   | <u>AMOUNT</u>  | PERCENT   |
|                    | 1. Total Dollars  | inder Miller der Market und der einem der der der der der der der der der der  | \$_241,349,000   | 100.0 %   |
|                    | 2. To Large Busines   | SS.  | \$ 212,330,567   | 88.0 %  |
|                    | 3. To Small Busines   | SS .   | \$ 29,018,433  | 12.0 %  |
|                    |   |  |  | PERCENT OF  |
|                    | SMALL BUSINESS  | SUBSETS:   | <u>AMOUNT</u>  | ITEM 1 TOTAL  |
|                    | 4. Disadvantaged  |  | \$ <u>6,284,864</u>  | 2.6%  |
|                    | 5. HBCUs/MIs  |  | <b>\$</b> 0  | 0.0 %   |
|                    | 6. Woman-Owned  |  | \$ 3,095,530   | 1.3 %   |
|                    | 7. Non-disadvantage   | ed   | \$ 19,638,039  | 8.1 %   |
|                    | Items 4 & 5 are le  | explanation is required.  ess than 5% of the total   | en combined percentages a  | re less than 5%. If   |
|                    | Items 4 & 5 are lesservices and launches subcontracted, service or launch   | explanation is required.  ess than 5% of the total ch insurance represent a and there are no small of insurance providers ava  | en combined percentages and dollars because subcontract very large portion of the tor small disadvantaged bushilable.  | ets for launch total amount to siness launch  |
|                    | Items 4 & 5 are lesservices and launches subcontracted, service or launch   | explanation is required.  ess than 5% of the total ch insurance represent a and there are no small insurance providers ava to 16% of the Planned   | en combined percentages and dollars because subcontract very large portion of the tor small disadvantaged bus  | cts for launch total amount to siness launch  |
|                    | Items 4 & 5 are lesservices and launches subcontracted, service or launch  Items 4 and 6 sum launch insurance are no current.   | explanation is required.  ess than 5% of the total ch insurance represent a and there are no small of insurance providers ava- to 16% of the Planned are removed and sum to ently identified value ad as the program proceeds  | dollars because subcontract very large portion of the tor small disadvantaged bushilable.  Subcontract Base if launc   | ets for launch total amount to siness launch h services and Contract Value.                         |
| Upo<br>(\$1<br>app | Items 4 & 5 are lesservices and launch be subcontracted, service or launch  Items 4 and 6 sum launch insurance and launch insurance and launch insurance and launch insurance and launch insurance and launch insurance and launch insurance and launch insurance and launch insurance and launch insurance and launch insurance and launch insurance and launch insurance and launch insurance are no currently and launch insurance and launch insurance are no currently and launch insurance are no | ess than 5% of the total ch insurance represent a and there are no small ch insurance providers available to 16% of the Planned are removed and sum to ently identified value ad as the program proceeds HBCUs and MIs.  diffication to this contion), Hughes will providers | dollars because subcontract very large portion of the tor small disadvantaged busilable.  Subcontract Base if launce 4% of the Total Current Contract Current Contract Current Contract exceeding the \$50 mptly negotiate applicable ages. The following parages. | cts for launch total amount to siness launch h services and Contract Value.  program for cluate the |

| HE Or           | ganization Name:  | Hughes Space and C   | Communications  | Company                                 | LAMOIT.   |
|-----------------|---|--|---|---|---|
| Date:           | 01/12/98  | Contract/RFP No:   | RFP5-02520/4  | 27                                      |   |
| Plan N          | o: <u>SC97-04-A</u>   | HE Ref. No.:   |   |   |   |
| 4. <u>MC</u>    | DIFICATIONS (conti  | nued)  |   |   |   |
| PLAN            | NED SUBCONTRACT   | BASE: FROM   |   | 7                                       | ГО  |
| 1. Tota         | al Dollars  | \$   | 100.0 %   | <b>S</b>                                | 100.0 %   |
| 2. To l         | Large Business  | The contract of the contract o | %   | · · · · S · · · · · · · · · · · · · · · | regarded and the extension of the first of the extension |
| 3. To S         | Small Business  | \$   | %   | \$                                      | %   |
| SMAL            | L BUSINESS SUBSET   | S:   |   |   |   |
| 4. Disa         | dvantaged   | \$   | %   | \$                                      | %   |
| 5. HB(          | CUs/MIs   | \$   | %   | \$                                      | %   |
| 6. Wor          | nan-Owned   | \$   | %   | \$                                      | %   |
| 7. Non          | -Disadvantaged  | \$   | %   | \$                                      | %   |
| the<br>opp      | ions to Develop Partici<br>following specific ef<br>ortunity to participate i<br>achievement of the abo | forts will be undert n the performance of  | aken to aid SI  | DB concer                               | rns to receive an   |
|                 |   |  |   |   |   |
|                 |   |  |   |   |   |
| Apposition Subc | NCIPAL PRODUCTS And a subcont on tracted to small bushly and economically d                             | contains a description racted and identifications concerns, small  | on of the princip<br>ation of those<br>business conce | areas ai<br>ms owned                    | nticipated to be and operated by  |
|                 | •   | -  |   |   |   |

Responsibility for the implementation and administration of this subcontracting plan is vested in the responsible Plan Administrator whose name appears on the cover sheet. Hughes reserves the right to substitute another qualified individual as Plan Administrator should the need arise. The duties of the Plan Administrator shall include but not be limited to

7. PLAN ADMINISTRATOR

the following:

| HE | Org | aniz:  | ation | Name:  |
|----|-----|--------|-------|--------|
|    | OIR | aill Z | auon  | maine: |

Hughes Space and Communications Company

Date: 01/12/98

Contract/RFP No:

RFP5-02520/427

Plan No: SC97-04-A

HAC Ref. No.:

L0226

#### 7. PLAN ADMINISTRATOR (continued)

- a) Prepare small business subcontracting plans which include percentage goals, a description of efforts facilitating SB and SDB participation, assurances that subcontracts contain flow-down provisions, agreement to submit reports and a recitation of records maintained including small business source lists.
- b) Require all Materiel organizations designated to perform work under the Company contract to provide total estimated procurement dollars to be let via assist work authorizations including the estimated amount targeted for large, small and small disadvantaged business concerns.
- c) Structure percentage goals for inclusion in the subcontracting plan using identifiable subcontract materials in the development of such goals, communicate such goals to procurement personnel and require supporting Groups and Divisions to maintain records of solicitations and awards and to submit performance reports against established goals so that information may be fed back to the government.
- d) Assure Materiel contract briefs disclose terms and conditions of the Company contract concerning small business plans including provisions for incentive award fees and reporting requirements and make certain that such briefs are distributed to all performing organizations.
- e) Make sure during Make-or-Buy Board meetings that SB and SDB capabilities are adequately considered and that such firms are listed as potential sources on the make-orbuy plan.
- f) Review bills of material to determine economic ordering quantities suitable for procurement from SB and SDB and examine program work breakdown structures to determine alternative ways in which material and services may be acquired from SB and SDB concerns.
- g) Coordinate with Group/Divisional SPAs prior to subcontract plan submission to develop listings of prospective SB and SDB bidders that are capable of performing work for known procurements and set time periods for bidding and delivery schedules to enable them to compete.
- h) Advocate SB and SDB interests during Procurement Review Committee meetings to ensure that small firms are equitably considered during the source selection process. Maintain and evaluate records of small disadvantaged business and HBCU/MI solicitation responses to assist in determining ability to compete.
- Bring to Materiel, Contracts and Program Management's attention any matter that could impair accomplishment of actions specified in subcontracting plans which might adversely affect the Company contracts.

| HE Organization Name: |           | Hughes Space and Communications Company |                |  |
|-----------------------|-----------|---|----------------|--|
| Date: _               | 01/12/98  | Contract/RFP No:                        | RFP5-02520/427 |  |
| Plan No:              | SC97-04-A | HE Ref. No.:                            | 1.0226         |  |

#### **APPENDIX I**

# PRINCIPAL PRODUCTS AND SERVICE AREAS BY

#### **BUSINESS SIZE CATEGORIES**

Hughes Electronics Corporation, relative to the above Contract/RFP, anticipates procurement of the following listed products and services from the following categories of business concerns:

|   |       | ALL SM      | IALL BU | SINES | S CONC | ERNS |
|---|-------|-------------|---------|-------|--------|------|
| PRODUCT/SERVICE                                     |       |             |         |       | DVANT  |      |
|   | LARGE | SB          | WOB     | SDB   | HBCU   | MI   |
| 1. Launch Services                                  |       |             |         |       |        |      |
| 2. Instruments                                      |       | •           |         |       |        |      |
| 3. Engineering Services                             | ·     |             |         |       |        |      |
| 4. Ground Support System Upgrades                   |       |             |         |       |        |      |
| 5. EDDS Administration                              |       | <del></del> |         |       |        |      |
| 6. Electrical Assembly and Fabrication              |       |             |         |       |        |      |
| 7. Fabricated Fixtures, Parts, Fittings, Mechanisms |       |             |         |       |        |      |
| 8. Structures                                       |       |             |         |       |        | .,   |
| 9. Software   |       |             |         |       |        |      |
| 10. Integration and Test                            |       |             |         |       |        |      |
| 11. Hi Rel Parts                                    |       |             |         |       |        |      |
| 12. Test Equipment                                  |       |             |         |       |        |      |
| 13. MLI   |       |             |         |       |        |      |

Legend:

SB = Small Business, SDB = Small Disadvantaged Business, MI = Minority Institution, WOB = Women-Owned Business, HBCU = Historically Black College or University

# HSC <u>Amendment</u> to HUGHES AIRCRAFT COMPANY ANNUAL MASTER SUBCONTRACTING PLAN

Small and Small Disadvantaged Business

#### 3. BASIS FOR SETTING GOALS

#### 5. REPORTS

Standard Form 294, "Subcontracting Report for Individual Contracts", will be submitted to the Contracting Office as required by the Contract.

#### IX. RECORD KEEPING

In addition to the automated classification system utilized by Hughes Aircraft Company, the Hughes Space and Communications Company captures solicitation and award information on all procurements through the assignment of an award code to each procurement. The award code indicates the business size receiving he award, i.e., small, small disadvantaged, small woman owned business concerns, HBCUs and MIs. Further, the award code indicates the degree of participation in the solicitation process by small and small disadvantaged business concerns. This information is captures on a contract-by-contract basis through HSC's JIT Procurement System which also maintains a permanent record of award information.

#### X. OUTREACH PROGRAM

HSC's Socioeconomic Programs Administrator maintains contacts with minority and small business trade associations and regularly participates in small and small disadvantaged business procurement conferences and trade fairs. All records relative to communication with these associations and participation in outreach events are located in the HSC Socioeconomic Programs Office.

SDB PLAN NO. SC97-04-B (GOES P)

| HE Organization Name:  | Hughes Space and (                | Exhibit 4 Communications Company  |
|--|-----------------------------------|---|
| Date: 01/12/98   | Contract/RFP No:                  | RFP5-02520/427  |
| Plan No: SC97-04-B   | HAC Ref. No.:                     | L0226   |
| Modification No.:  |                                   |   |
| MASTER<br>APPROVI  | SUBCONTRACTI<br>ED FOR USE DURI   | CTING GOALS UNDER<br>NG PLAN HEMSP97-98<br>NG FISCAL YEAR 1998  |
| DCMD   | NISTRATIVE CONT<br>W-CACO FOR THE | TRACTING OFFICER D.P. SPRINGER,<br>UTILIZATION OF:  |
| <ul> <li>Small Business Concerns</li> <li>Small Disadvantaged Bus</li> <li>Small Women Owned Bu</li> </ul> | siness Concerns                   | <ul> <li>Historically Black Colleges,</li> <li>Universities and Minority</li> <li>Institutions</li> </ul>   |
| Submitted By: Group Address City, State  | Hugh 2260                         | HES ELECTRONICS CORPORATION es Space and Communications Company E. Imperial Highway gundo, California 90245 |
| Plan Administrator: Title Location Telephone   | Mark<br>Subco<br>SC/S1            | A. Burris<br>Intract Manager<br>0/S382<br>416-2291  |
| Socioeconomic Programs Admi<br>Name<br>Location<br>Telephone   | nistrator: Louise SC/S4           | Erickson<br>1/A345<br>364-6067  |
| Contract Administrator: Title Location Telephone   | James Manag SC/S41                | T. Felicita<br>er, NASA Contracts   |
| Principal Contracting Officer: Agency Address Telephone  | NASA<br>Greenbe                   | Marshall Goddard Space Flight Center elt, MD 20771 86-4472  |
| Administrative Contracting Office Agency Address Telephone   | Defense<br>c/o Hug<br>RE/R11      | Harrington Contract Management Command hes Aircrast Company, Los Angeles, CA M306                           |
| receptione   | (310) 36                          | 4-04/2  |

| ``\ | HE Organization Name:                     | Hughes Sac   | oo and (  | Communication | - C  | Exhibit 4 |
|-----|---|--|-----------|---------------|--|-----------|
| •   | The Organization Ivanic.                  | s Company  |           |               |  |           |
|     | Date: 01/12/98                            | Contract/RI  | FP No:    | RFP5-02520/   | 427  |           |
|     | Plan No: SC97-04-B                        | HAC Ref. 1   | No.:      | L0226         |  |           |
|     | Modification No.:                         |  |           | ·<br>-        |  |           |
|     | 1. CONTRACT INFORMAT                      | <u>ION</u>   |           |               |  |           |
|     | Contract/RFP No.                          | entre invent transfer visco visco transfer en la seguinación en en visco de la constitución de la constitución | RFP5-C    | 2520/427      | ethiologista. Veneziga ethiologis e rein (AMA) ustra geographic desir ee fination o eelika e discussioni veneg |           |
|     | Description                               | -  | GOES      | P (Option 1)  |  |           |
|     | Period of Performance                     | -  | 4/30/03   | - 9/28/06     |  |           |
|     | Effective Date of Contract                | eit _  |           |               |  |           |
|     | Change No.                                | Date: _  | ,         |               |  |           |
|     | 2. VALUES                                 |  |           |               |  |           |
|     | 2. <u>VALUES</u> Total Current Contract V | alue   | \$        |               | 190,900,000  |           |
|     | Planned Subcontract Doll                  | ars  | \$        |               | 148,002,000  | 100.0%    |
|     | Planned Domestic Subcor                   | tract Dollars  | <b>\$</b> |               | 147,402,000  | 99.6%     |

#### 3: GOALS

For the purpose of this individual subcontracting plan, the following separate percentage goals are hereby expressed in terms of a percentage of total planned domestic subcontract dollars. The goal for small disadvantaged business concerns includes consideration of Historically Black Colleges and Universities and Minority Institutions in a composite SDBs, HBCUs, and MIs Goal, and while stated separately as a percentage of planned subcontract dollars, is included in the goal for small business concerns and constitutes a subset thereof. Goals for Small Business Concerns owned and operated by Woman or Women, if required as part of this subcontracting plan will be stated separately; but, will be included in the goal for small business concerns and constitutes a subset thereof. These planned subcontract dollars included all first tier subcontracts to be awarded in the performance of this contract but unless specifically and separately stated as stand-alone items do not include the cost of any products or services normally allocated as indirect or overhead.

The Hughes Electronics Corporation hereby commits to continue applying its organized and proven resources in carrying out the government's socioeconomic program objectives and hereby agrees to strive for achievement of the following goal

| HE Organization Name:  | Hughes Space and                             | Communications Compar  | Exhibit 4          |
|--|--|--|--------------------|
| Date: 01/12/98   | Contract/RFP No:                             |  |                    |
| Plan No: SC97-04-B   | HAC Ref. No.:                                | L0226  |                    |
| 3. a) Individual Goals   |  |  |                    |
| PLANNED SUBCON   | TRACT BASE                                   | AMOUNT   | DED 000 mi         |
| 1. Total Dollars   | TICACI DAJE.                                 | <u>AMOUNT</u><br>\$ 147,402,000  | PERCENT            |
| 2. To Large Business   |  | ,,   | 100.0 %            |
| 3. To Small Business   |  |  | 98.7 %             |
| 2  |  | \$1,922,017  | 1.3 %              |
| CLASS DISTURBED  |  |  | PERCENT OF         |
| SMALL BUSINESS S   | UBSETS:                                      | <u>AMOUNT</u>  | ITEM 1 TOTAL       |
| 4. Disadvantaged   |  | \$ <u>1,170,683</u>  | 0.8 %              |
| 5. HBCUs/MIs   |  | \$0  | 0.0 %              |
| 6. Woman-Owned   |  | \$576,605  | 0.4 %              |
| 7. Non-disadvantaged   |  | \$174,729  | 0.1 %              |
| services and launch  | insurance represent a d there are no small o | dollars because subcontractivery large portion of the torsion small disadvantaged busidable. | otal amount to     |
| Items 4 and 6 sum to   | 16% of the Dlanned                           | Subcontract Base if launch   |                    |
| launch insurance are   | removed and sum to                           | 4% of the Total Current C  | ontract Value      |
|  |  |  |                    |
| There are no currently   | y identified value add                       | led opportunities on this p  | rogram for         |
| HBCUs/MIs, but as t  | he program proceeds                          | we will continue to reeval   | uate the           |
| opportunities for HBC  | CUs and MIs.                                 |  |                    |
| 4. MODIFICATIONS Upon receipt of a modifi (\$1,000,000 for construction appropriate subcontract goal to contract modifications in ex | ), Hughes will pron<br>reflecting those chan | iptly negotiate applicable   | revisions to the   |
| Change number contract value by \$ This change impacts the plann   | to a new to                                  | increases (decreotal contract value of \$ents as follows:                                    | ases) the previous |

|   | HE Organization Name:  | Hughes Space and C   | Communications                                     | s Company                                   | Exhibit 4                                       |
|---|--|--|--|---|---|
|   | Date: 01/12/98   | Contract/RFP No:   | RFP5-02520/4                                       | <b>1</b> 27                                 |   |
|   | Plan No: SC97-04-B   | HE Ref. No.:   |  |   |   |
|   | 4. MODIFICATIONS (continued of the PLANNED SUBCONTRACT). Total Dollars   | inued)<br>I BASE: FROM<br>\$   | 100.004  | TO  |   |
|   | 2. To Large Business   |  | 100.0 %  | <u> </u>                                    | <u>100.0</u> %                                  |
|   | 3. To Small Business   | \$   | %  | \$  | %   |
|   |  | \$   | %  | \$  | %   |
|   | SMALL BUSINESS SUBSET  |  |  |   |   |
|   | 4. Disadvantaged   | \$   | %  | \$  | %   |
|   | 5. HBCUs/MIs   | \$   | %  | \$  | %   |
|   | 6. Woman-Owned   | \$   | %  | \$  | <u> </u>  |
|   | 7. Non-Disadvantaged   | \$   | %  | \$.   | <u></u> %                                       |
|   | opportunity to participate in the achievement of the above   | n the performance of ve stated SDB goal:                             | this contract as                                   | subcontracto                                | rs and to aid in                                |
|   |  |  |  |   |   |
|   | 6. PRINCIPAL PRODUCTS A Appendix I attached hereto scheduled to be subcontraubcontracted to small busing socially and economically di                          | contains a description racted and identifica ness concerns, small b  | of the principation of those ousiness concern      | areas antic<br>ns owned an                  | ipated to be                                    |
| • | 7. PLAN ADMINISTRATOR Responsibility for the implementation of the responsible of the Hughes reserves the right to should the need arise. The duthe following: | ementation and admi<br>Plan Administrator w<br>substitute another qu | nistration of the<br>hose name appualified individ | uis subcontra<br>ears on the<br>ual as Plan | ecting plan is<br>cover sheet.<br>Administrator |

| _       |   |   |    |    |   |
|---------|---|---|----|----|---|
| Ex      | L | : | 1_ | •  | 4 |
| r Y     | п | 1 | n  | 17 | 4 |
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|-----|----|--------|-----|-------|-----|-------|
| н   | Ŀ١ | Ur     | gan | 12.at | ion | Name: |

Hughes Space and Communications Company

Date: 01/12/98

Contract/RFP No:

RFP5-02520/427

Plan No: SC97-04-B

HAC Ref. No.:

L0226

### 7. PLAN ADMINISTRATOR (continued)

- a) Prepare small business subcontracting plans which include percentage goals, a description of efforts facilitating SB and SDB participation, assurances that subcontracts contain flow-down provisions, agreement to submit reports and a recitation of records maintained including small business source lists.
- b) Require all Materiel organizations designated to perform work under the Company contract to provide total estimated procurement dollars to be let via assist work authorizations including the estimated amount targeted for large, small and small disadvantaged business concerns.
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- d) Assure Materiel contract briefs disclose terms and conditions of the Company contract concerning small business plans including provisions for incentive award fees and reporting requirements and make certain that such briefs are distributed to all performing organizations.
- e) Make sure during Make-or-Buy Board meetings that SB and SDB capabilities are adequately considered and that such firms are listed as potential sources on the make-orbuy plan.
- f) Review bills of material to determine economic ordering quantities suitable for procurement from SB and SDB and examine program work breakdown structures to determine alternative ways in which material and services may be acquired from SB and SDB concerns.
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| HE Organization Name: | Hughes Space and ( | Communications Company |   |
|-----------------------|--------------------|------------------------|---|
| Date: 01/12/98        | Contract/RFP No:   | RFP5-02520/427         |   |
| Plan No: SC97-04-B    | HE Ref. No.:       | L0226                  | _ |

#### **APPENDIX I**

# PRINCIPAL PRODUCTS AND SERVICE AREAS BY BUSINESS SIZE CATEGORIES

Hughes Electronics Corporation, relative to the above Contract/RFP, anticipates procurement of the following listed products and services from the following categories of business concerns:

|   |       | ALL SN | AALL BU | SINES | S CONC | ERN |
|---|-------|--------|---------|-------|--------|-----|
| PRODUCT/SERVICE                                     |       |        |         |       | DVANT  |     |
|   | LARGE | SB     | WOB     | SDB   |        |     |
| 1. Launch Services                                  |       |        |         |       |        |     |
| 2. Instruments                                      |       |        |         |       |        |     |
| 3. Engineering Services                             |       |        |         |       | ·      |     |
| 4. Ground Support System Upgrades                   |       |        |         |       |        |     |
| 5. EDDS Administration                              |       |        |         |       |        |     |
| 6. Electrical Assembly and Fabrication              |       | ·      |         |       |        |     |
| 7. Fabricated Fixtures, Parts, Fittings, Mechanisms |       |        |         |       |        |     |
| 8. Structures                                       |       |        |         |       |        |     |
| 9. Software   |       |        |         |       |        |     |
| 10. Integration and Test                            |       |        |         |       |        |     |
| 11. Hi Rel Parts                                    |       |        |         |       |        |     |
| 12. Test Equipment                                  |       |        |         |       |        |     |
| 13. MLI   |       |        |         |       |        |     |

Legend:

SB = Small Business, SDB = Small Disadvantaged Business, MI = Minority Institution, WOB = Women-Owned Business, HBCU = Historically Black College or University

#### HSC Amendment to HUGHES AIRCRAFT COMPANY ANNUAL MASTER SUBCONTRACTING PLAN

Small and Small Disadvantaged Business

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#### 5. REPORTS

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SDB PLAN NO. SC97-04-C (GOES Q)

|   |  |   | F 131   |                |
|---|--|---|---|----------------|
|   | HE Organization Name:  | Hughes Space and                        | Exhibit Communications Company  | 4              |
|   | Date: 01/12/98   | Contract/RFP No:                        | RFP5-02520/427  |                |
|   | Plan No: SC97-04-C   | HAC Ref. No.:                           | L0226   |                |
|   | Modification No.:  |   |   |                |
|   |  |   | CTING GOALS UNDER   |                |
|   |  |   | NG PLAN HEMSP97-98  |                |
|   | BY CORPORATE ADM   | INISTRATIVE CON                         | NG FISCAL YEAR 1998<br>FRACTING OFFICER D.P. SPRINGER,<br>E UTILIZATION OF:                     |                |
|   | <ul> <li>Small Business Concern</li> <li>Small Disadvantaged B</li> <li>Small Women Owned B</li> </ul> | usiness Concerns                        | <ul> <li>Historically Black Colleges,<br/>Universities and Minority<br/>Institutions</li> </ul> |                |
|   | Submitted By:  | нис                                     | HES ELECTRONICS CORPORATION   |                |
|   | Group  |   | nes Space and Communications Company  |                |
|   | Address  | •                                       | E. Imperial Highway   | _              |
|   | City, State  |   | gundo, California 90245   | <del>-</del> . |
|   | Plan Administrator:  | Mark                                    | A. Burris   | _              |
| ) | Title  |   | ontract Manager   | -              |
|   | Location   |   | 10/S382   | -              |
|   | Telephone  |   | 416-2291  | -              |
|   | Socioeconomic Programs Adr   | ministrator:                            |   | -              |
|   | Name   |   | e Erickson  |                |
|   | Location   |   | 11/A345   | <b>-</b> `     |
|   | Telephone  |   | 364-6067  | -              |
|   | Contract Administrator:  | James                                   | T. Felicita   | •              |
|   | Title  |   | ger, NASA Contracts   | ,              |
|   | Location   |   | 1/A370  |                |
|   | Telephone .  | (310)                                   | 416-4244  |                |
|   | Principal Contracting Officer:   | Sandr                                   | ı Marshall  |                |
|   | Agency   | NASA                                    | Goddard Space Flight Center   |                |
|   | Address  |   | pelt, MD 20771  |                |
|   | Telephone  | (301)                                   | 286-4472  |                |
|   | Administrative Contracting O   | fficer Bethar                           | n Harrington  |                |
|   | Agency   | *************************************** | e Contract Management Command   |                |
|   | Address  |   | ghes Aircraft Company, Los Angeles, CA  |                |
|   |  |   | 1/M306  |                |
| ) | Telephone  | (310) 3                                 | 64-6472   |                |

:

|             | HE Organization Name: Hughes Sp.     | ace and    | Communications                        | Company     | Exhibit 4  |
|-------------|--------------------------------------|------------|---------------------------------------|-------------|--|
|             | Date: 01/12/98 Contract/R            | FP No:     | RFP5-02520/4                          | 127         |  |
|             | Plan No: SC97-04-C HAC Ref. 1        | No.:       | L0226                                 |             |  |
|             | Modification No.:                    |            | _                                     |             | <u>.</u>   |
|             | 1. CONTRACT INFORMATION              |            |                                       |             |  |
| er (Jurger) | Contract/RFP No.                     | RFP5-(     | 2520/427                              |             | and the state of t |
|             | Description                          | GOES       | Q (Option 2)                          |             |  |
|             | Period of Performance                | 4/30/05    | - 9/28/08                             |             |  |
|             | Effective Date of Contract           |            |                                       |             |  |
|             | Change No Date:                      | ·          | · · · · · · · · · · · · · · · · · · · |             |  |
|             | 2. VALUES                            |            |                                       |             |  |
|             | Total Current Contract Value         | \$ _       |                                       | 185,000,000 | •  |
| )           | Planned Subcontract Dollars          | \$_        |                                       | 153,393,000 | 100.0%   |
|             | Planned Domestic Subcontract Dollars | <b>s S</b> |                                       | 152 793 000 | 99.6%  |

#### 3. GOALS

For the purpose of this individual subcontracting plan, the following separate percentage goals are hereby expressed in terms of a percentage of total planned domestic subcontract dollars. The goal for small disadvantaged business concerns includes consideration of Historically Black Colleges and Universities and Minority Institutions in a composite SDBs, HBCUs, and MIs Goal, and while stated separately as a percentage of planned subcontract dollars, is included in the goal for small business concerns and constitutes a subset thereof. Goals for Small Business Concerns owned and operated by Woman or Women, if required as part of this subcontracting plan will be stated separately; but, will be included in the goal for small business concerns and constitutes a subset thereof. These planned subcontract dollars included all first tier subcontracts to be awarded in the performance of this contract but unless specifically and separately stated as stand-alone items do not include the cost of any products or services normally allocated as indirect or overhead.

The Hughes Electronics Corporation hereby commits to continue applying its organized and proven resources in carrying out the government's socioeconomic program objectives and hereby agrees to strive for achievement of the following goal

| ()   | HE Organization Name:  | Hughes Space and (   | Communications Company  | Exhibit 4        |
|--|--|--|---|------------------|
|  | Date: 01/12/98   | Contract/RFP No:   | RFP5-02520/427  |                  |
|  | Plan No: SC97-04-C   | HAC Ref. No.:  | L0226   |                  |
|  | 3. a) Individual Goals   |  |   |                  |
|  | PLANNED SUBCON   | TRACT BASE.  | ANGLINE   |                  |
| and the second s | 1. Total Dollars   | and the state of t | <u>AMOUNT</u><br>\$ 152,793,000   | PERCENT          |
|  | 2. To Large Business   |  | \$ 151,624,450  | 100.0 %          |
|  | 3. To Small Business   |  | \$ 1,168,550  | 99.2 %           |
|  |  |  | <b>4</b>  | 0.8 %            |
|  | CMALL DUODIEGO   |  |   | PERCENT OF       |
|  | SMALL BUSINESS S   | SUBSETS:   | AMOUNT  | ITEM 1 TOTAL     |
|  | <ol> <li>Disadvantaged</li> <li>HBCUs/MIs</li> </ol>   |  | \$ 711,753  | <u> </u>         |
|  | 6. Woman-Owned   |  | \$0   | 0.0 %            |
|  |  | ÷  | \$ 350,565  | 0.2 %            |
|  | 7. Non-disadvantaged   |  | \$ 106,232  | <u> </u>         |
| 0  | Item 5 is zero a brief ex  Items 4 & 5 are less services and launch be subcontracted, ar   | planation is required.  than 5% of the total of insurance represent a  | o combined percentages are combined percentages are collars because subcontracts very large portion of the total resmall disadvantaged businglable. | for launch       |
|  | Items 4 and 6 sum to   | 16% of the Planned   | Subcontract Base if launch s  | services and     |
|  | launch insurance are   | removed and sum to   | 4% of the Total Current Cor   | ntract Value.    |
|  | There are no current   |  |   |                  |
|  | HBCUs/MIs but as   | the program proceeds   | ed opportunities on this pro  | gram for         |
|  | opportunities for HB   | CUs and MIs  | we will continue to reevalua  | ate the          |
|  | 4. MODIFICATIONS Upon receipt of a modif (\$1,000,000 for construction appropriate subcontract goal to contract modifications in e | ication to this cont<br>n), Hughes will prom<br>reflecting those chan  | ptly negotiate applicable r   | evisions to the  |
| ()   | Change number contract value by \$ This change impacts the plan  |  | increases (decreases tal contract value of \$nts as follows:  | es) the previous |

| ()   | HE Organization Name:   | Hughes Space and C   | Communications   | Company                     | Exhibit 4                   |
|--|---|--|--|-----------------------------|-----------------------------|
|  | Date: 01/12/98  | _ Contract/RFP No:   | RFP5-02520/4   | 27                          |                             |
|  | Plan No: SC97-04-C  | HE Ref. No.:   |  |                             |                             |
|  | 4. MODIFICATIONS (cont<br>PLANNED SUBCONTRAC  |  |  | <b>77.0</b>                 |                             |
|  | 1. Total Dollars  | I BASE: FROM   | 100.0 %  | TO                          | 100.004                     |
| ery particular in the entered legislatury in particular entered to a | 2. To Large Business  | • • • • • • • • • • • • • • • • • • •                                    |  | <u> </u>                    | 100.0 %                     |
|  | 3. To Small Business  | <u> </u>   | %  | \$                          | %                           |
|  | SMALL BUSINESS SUBSE  | тс.  | %  | <b>3</b>                    | %                           |
|  | 4. Disadvantaged  | TO:  | 0/   | •                           | •                           |
|  | 5. HBCUs/MIs  | 3  | %  | 3                           | %                           |
|  | 6. Woman-Owned  | <u> </u>   | %  | \$                          | %                           |
|  |   | 3  | %  | 2                           | %                           |
|  | 7. Non-Disadvantaged  | 2  | %  | <b>5</b>                    | %                           |
|  | the achievement of the abo  | ove stated SDB goal:   |  |                             |                             |
|  |   |  |  |                             |                             |
|  | <ol> <li>PRINCIPAL PRODUCTS         Appendix I attached hereto scheduled to be subcont subcontracted to small bus socially and economically designed.     </li> </ol> | contains a description<br>tracted and identificatiness concerns, small   | n of the principa<br>tion of those<br>business concern | areas anticipons owned and  | ated to be operated by      |
|  | 7. PLAN ADMINISTRATOR Responsibility for the imposted in the responsible Hughes reserves the right of should the need arise. The of the following:                    | plementation and adm.<br>Plan Administrator w<br>to substitute another q | hose name appualified individ                          | ears on the cual as Plan Ac | over sheet.<br>Iministrator |

HE Organization Name:

Hughes Space and Communications Company

Date: 01/12/98

Contract/RFP No:

RFP5-02520/427

Plan No: SC97-04-C

C97-04-C H

HAC Ref. No.:

L0226

#### 7. PLAN ADMINISTRATOR (continued)

- a) Prepare small business subcontracting plans which include percentage goals, a description of efforts facilitating SB and SDB participation, assurances that subcontracts contain flow-down provisions, agreement to submit reports and a recitation of records maintained including small business source lists.
- b) Require all Materiel organizations designated to perform work under the Company contract to provide total estimated procurement dollars to be let via assist work authorizations including the estimated amount targeted for large, small and small disadvantaged business concerns.
- c) Structure percentage goals for inclusion in the subcontracting plan using identifiable subcontract materials in the development of such goals, communicate such goals to procurement personnel and require supporting Groups and Divisions to maintain records of solicitations and awards and to submit performance reports against established goals so that information may be fed back to the government.
- d) Assure Materiel contract briefs disclose terms and conditions of the Company contract concerning small business plans including provisions for incentive award fees and reporting requirements and make certain that such briefs are distributed to all performing organizations.
- e) Make sure during Make-or-Buy Board meetings that SB and SDB capabilities are adequately considered and that such firms are listed as potential sources on the make-or-buy plan.
- f) Review bills of material to determine economic ordering quantities suitable for procurement from SB and SDB and examine program work breakdown structures to determine alternative ways in which material and services may be acquired from SB and SDB concerns.
- g) Coordinate with Group/Divisional SPAs prior to subcontract plan submission to develop listings of prospective SB and SDB bidders that are capable of performing work for known procurements and set time periods for bidding and delivery schedules to enable them to compete.
- h) Advocate SB and SDB interests during Procurement Review Committee meetings to ensure that small firms are equitably considered during the source selection process. Maintain and evaluate records of small disadvantaged business and HBCU/MI solicitation responses to assist in determining ability to compete.
- i) Bring to Materiel, Contracts and Program Management's attention any matter that could impair accomplishment of actions specified in subcontracting plans which might adversely affect the Company contracts.

| HE Organ | ization Name: | Hughes Space and C | ommunications Company |
|----------|---------------|--------------------|-----------------------|
| Date: 0  | 1/12/98       | Contract/RFP No:   | RFP5-02520/427        |
| Plan No: | SC97-04-C     | HE Ref. No.        | I 0226                |

#### **APPENDIX I**

# PRINCIPAL PRODUCTS AND SERVICE AREAS BY

#### **BUSINESS SIZE CATEGORIES**

Hughes Electronics Corporation, relative to the above Contract/RFP, anticipates procurement of the following listed products and services from the following categories of business concerns:

|   |       | ALL SN | MALL BU |     |        |       |
|---|-------|--------|---------|-----|--------|-------|
| PRODUCT/SERVICE                                     | ļ ·   |        |         |     | DVANTA |       |
|   | LARGE | SB     | WOB     | SDB | HBCU   | MI    |
| 1. Launch Services                                  |       |        |         |     |        |       |
| 2. Instruments                                      |       | _      |         |     |        |       |
| 3. Engineering Services                             |       |        |         |     |        |       |
| 4. Ground Support System Upgrades                   |       |        |         |     |        | · · · |
| 5. EDDS Administration                              |       |        |         |     |        |       |
| 6. Electrical Assembly and Fabrication              |       |        |         |     |        |       |
| 7. Fabricated Fixtures, Parts, Fittings, Mechanisms |       |        |         |     |        |       |
| 8. Structures                                       |       |        |         |     |        |       |
| 9. Software   |       |        |         |     |        |       |
| 10. Integration and Test                            |       |        |         |     |        |       |
| 11. Hi Rel Parts                                    |       |        |         |     |        |       |
| 12. Test Equipment                                  |       |        |         |     |        |       |
| 13. MLI   |       |        |         |     |        |       |

Legend:

SB = Small Business, SDB = Small Disadvantaged Business, MI = Minority Institution, WOB = Women-Owned Business, HBCU = Historically Black College or University

#### HSC Amendment

to

HUGHES AIRCRAFT COMPANY
ANNUAL MASTER SUBCONTRACTING PLAN

Small and Small Disadvantaged Business

#### 3. BASIS FOR SETTING GOALS

#### 5. REPORTS

Standard Form 294, "Subcontracting Report for Individual Contracts", will be submitted to the Contracting Office as required by the Contract.

#### IX. RECORD KEEPING

In addition to the automated classification system utilized by Hughes Aircraft Company, the Hughes Space and Communications Company captures solicitation and award information on all procurements through the assignment of an award code to each procurement. The award code indicates the business size receiving he award, i.e., small, small disadvantaged, small woman owned business concerns, HBCUs and MIs. Further, the award code indicates the degree of participation in the solicitation process by small and small disadvantaged business concerns. This information is captures on a contract-by-contract basis through HSC's JIT Procurement System which also maintains a permanent record of award information.

#### X. OUTREACH PROGRAM

HSC's Socioeconomic Programs Administrator maintains contacts with minority and small business trade associations and regularly participates in small and small disadvantaged business procurement conferences and trade fairs. All records relative to communication with these associations and participation in outreach events are located in the HSC Socioeconomic Programs Office.

Attachment K

# PERFORMANCE BASED PAYMENTS COMPLETION CRITERIA

August 26, 1997

## Attachment K

## Performance Based Payments Completion Criteria

|                                       | GOES-N Milestones                  | ,                |             |
|---------------------------------------|------------------------------------|------------------|-------------|
| Milestone                             | Description                        | Document         | Para.       |
| · · · · · · · · · · · · · · · · · · · | Spacecraft System Level Re         | views            |             |
| NI                                    | System Concept Review              | S-415-27         | 1.3.2       |
| N2                                    | Preliminary Design Review          | S-415-27         | 1.3.3       |
| N3                                    | Critical Design Review             | S-415-27         | 1.3.4       |
| N4                                    | Mission Operations Review          | \$-415-27        | 1.3.5       |
| N5                                    | Pre-Environmental Review           | S-415-27         | 1.3.6       |
| N6                                    | Pre-Storage Review                 | \$-415-27        | 1.3.7       |
| N6A                                   | Pre-Shipment Review                | S-415-27         | 1.3.7       |
| N7                                    | Flight Operations Review           | S-415-27         | 1.3.8       |
| N8                                    | Spacecraft Launch Readiness Review | S-415-27         | 1.3.9       |
|                                       | Software Subsystem Review          | ews              | <del></del> |
| N9                                    | Concept Review                     | S-415-27         | 1.4.2       |
| N10                                   | Requirements Review                | \$-415-27        | 1.4.3       |
| N11                                   | Preliminary Design Review          | \$-415-27        | 1.4.4       |
| N12                                   | Critical Design Review             | S-415-27         | 1.4.5       |
| N13                                   | Test Readiness Review              | S-415-27         | 1.4.6       |
| N14                                   | Acceptance Review                  | Ş-415-27         | 1.4.7       |
|                                       | Spacecraft Support Ground System   | <del></del>      |             |
| N15                                   | System Concept Review              | S-415-27         | 1.5.2       |
| N16                                   | Preliminary Design Review          | S-415-27         | 1.5.3       |
| N17                                   | Critical Design Review             | S-415-27         | 1.5.4       |
| N18                                   | Pre-Shipment Review                | S-415-27         | 1.5.5       |
| N19                                   | Acceptance Review                  | S-415-27         | 1.5.6       |
| 1112                                  | Launch Services                    |                  |             |
| N20                                   | Launch Vehicle Interface           | LV-3.8-06        | 1           |
| 1120                                  | Requirements Document              | 2. 5.0 00        |             |
| N21                                   | Spacecraft/Launch Vehicle          | LV-3.8-01        |             |
| 1 122 1                               | Interface Control document         |                  |             |
| N22                                   | Mission Integration Program        | S-415-27         | 1.8.2       |
| 1122                                  | Kickoff Review                     | , 113 <u>2</u> , | 1           |
| N23                                   | Final Loads Verification Review    | S-415-27         | 1.8.3       |
| N24                                   | Launch Vehicle Requirements        | S-415-27         | 1.8.4       |
| N25                                   | Delta IV Pre-Installation Review   | S-415-27         | 1.8.5       |
| اله المامة ال                         | (Major Components)                 | 2 110 2          |             |
| N26                                   | Launch Vehicle Design              | S-415-27         | 1.8.6       |
| . 14-V                                | Certification Review               | 120              |             |
| N27                                   | Launch Vehicle Pre-Ship Review     | S-415-27         | 1.8.7       |
| N28                                   | Pre-VOS Review                     | S-415-27         | 1.8.8       |
| N29                                   | RESERVED                           |                  |             |

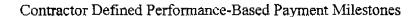
| N30   | Launch Vehicle Mission Peculiar/   | S-415-27   | 1.8.10  |
|---|--|--|---|
| 1/1/20  | Mission Unique Preliminary   | 3-4()-2/   | 1.6.10  |
|   | Design Review  |  |   |
| N31   | Launch Vehicle Mission Peculiar/   | S-415-27   | 1.8.11  |
| 1421  | Mission Unique Critical Design Review  | 5-715-27   | 1.0.11  |
| N32   | RESERVED   |  |   |
| N33   | LV Component/System Design Review  | S-415-27   | 1.8.12  |
| N34   | RESERVED   | S-415-27   | 1.6.12  |
| N35   | Senior NASA Management   | S-415-27   | 1.8.14  |
| 1033  | Mission Readiness Review   | 5-415-21   | 1.0.14  |
| N36   | Launch Readiness Review  | S-415-27   | 1.8.15  |
| 1430  | Electronic Data Distribution Sys   |  | 1.6.15  |
| N37   | EDDS Critical Design Review  | S-415-27   | 1.7   |
| N38   | EDDS Acceptance  | S-415-23   | 1.3.1   |
| 1/130   | System Events  | 3-713-23   | 1.5.1   |
| N39   | Spacecraft Engineering Handover  | S-415-27   | 1.3.10  |
| N40   | Final On-Orbit Acceptance  | Contract Clause  | B.8   |
| N101  | Delta IV Launch System Training Data Package   | LV-3.8-10  | D.0   |
| N101  | Launch Vehicle ICD (Delta IV)  | LV-3.8-01  |   |
| N105  | Preliminary Mission Analysis   |  |   |
| N100  | Mission Unique Design Review #1  | LV-3.8-02<br>S-415-27  | 1.8.10  |
| N108  | Final Mission Analysis   |  | 1.8.10  |
| N108  | Mission Unique Design Review #2  | LV-3.8-03<br>S-415-27  | 1.8.11  |
| I NITTO   | I Mission Linidile Design Review #7  | 3-413-71   | 1.8.11  |
| 11102   | Wildston Onique Design Review #2   |  | 2   |
|   |  |  |   |
| GOES-O  | <u> </u>   |  |   |
| GOES-O  | Tilestones Description   | Document   | Para.   |
| GOES-O  | Milestones Description Spacecraft System Level Review  | <b>Document</b>  | Рага.   |
| GOES-O Milestone  | Milestones Description Spacecraft System Level Review Critical Design Review   | Document ws S-415-27   | Para.   |
| GOES-O I<br>Milestone                                     | Milestones Description Spacecraft System Level Review Critical Design Review Mission Operations Review   | Document ws S-415-27 S-415-27  | Para. 1.3.4 1.3.5   |
| GOES-O Milestone O1 O2                                    | Milestones Description Spacecraft System Level Review Critical Design Review Mission Operations Review Pre-Environmental Review  | Document  WS  \$-415-27  \$-415-27  \$-415-27  | Para.  1.3.4  1.3.5  1.3.6  |
| O1 O2 O3 O4   | Milestones Description Spacecraft System Level Review Critical Design Review Mission Operations Review Pre-Environmental Review Pre-Storage Review   | Document ws S-415-27 S-415-27  | Para.  1.3.4 1.3.5 1.3.6 1.3.7                                      |
| O1<br>O2<br>O3<br>O4<br>O4A                               | Milestones Description Spacecraft System Level Review Critical Design Review Mission Operations Review Pre-Environmental Review Pre-Storage Review Pre-Shipment Review   | Document  ws  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27   | Para.  1.3.4 1.3.5 1.3.6 1.3.7 1.3.7                                |
| O1 O2 O3 O4 O4A O5  | Milestones Description Spacecraft System Level Review Critical Design Review Mission Operations Review Pre-Environmental Review Pre-Storage Review Pre-Shipment Review Flight Operations Review  | Document  WS  \$-415-27  \$-415-27  \$-415-27  \$-415-27  \$-415-27  \$-415-27                                   | Para.  1.3.4 1.3.5 1.3.6 1.3.7 1.3.7 1.3.8                          |
| O1<br>O2<br>O3<br>O4<br>O4A                               | Milestones  Description  Spacecraft System Level Review Critical Design Review Mission Operations Review Pre-Environmental Review Pre-Storage Review Pre-Shipment Review Flight Operations Review Spacecraft Launch Readiness Review   | Document  WS  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27                               | Para.  1.3.4 1.3.5 1.3.6 1.3.7 1.3.7                                |
| O1<br>O2<br>O3<br>O4<br>O4A<br>O5<br>O6                   | Milestones  Spacecraft System Level Review Critical Design Review Mission Operations Review Pre-Environmental Review Pre-Storage Review Pre-Shipment Review Flight Operations Review Spacecraft Launch Readiness Review Software Subsystem Reviews   | S-415-27<br>S-415-27<br>S-415-27<br>S-415-27<br>S-415-27<br>S-415-27<br>S-415-27                                 | Para.  1.3.4 1.3.5 1.3.6 1.3.7 1.3.7 1.3.8 1.3.9                    |
| O1 O2 O3 O4 O4A O5  | Milestones  Description  Spacecraft System Level Review Critical Design Review Mission Operations Review Pre-Environmental Review Pre-Storage Review Pre-Shipment Review Flight Operations Review Spacecraft Launch Readiness Review   | Document  WS  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27                               | Para.  1.3.4 1.3.5 1.3.6 1.3.7 1.3.7 1.3.8                          |
| O1<br>O2<br>O3<br>O4<br>O4A<br>O5<br>O6                   | Milestones  Description  Spacecraft System Level Review  Critical Design Review  Mission Operations Review  Pre-Environmental Review  Pre-Storage Review  Pre-Shipment Review  Flight Operations Review  Spacecraft Launch Readiness Review  Software Subsystem Reviews  Critical Design Review  | Document  WS  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27                               | Para.  1.3.4 1.3.5 1.3.6 1.3.7 1.3.7 1.3.8 1.3.9                    |
| O1<br>O2<br>O3<br>O4<br>O4A<br>O5<br>O6                   | Milestones  Description  Spacecraft System Level Review Critical Design Review Mission Operations Review Pre-Environmental Review Pre-Storage Review Pre-Shipment Review Pre-Shipment Review Flight Operations Review Spacecraft Launch Readiness Review Software Subsystem Reviews Critical Design Review Test Readiness Review   | Document  WS  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27                     | Para.  1.3.4 1.3.5 1.3.6 1.3.7 1.3.7 1.3.8 1.3.9                    |
| O1<br>O2<br>O3<br>O4<br>O4A<br>O5<br>O6                   | Milestones    Description     Spacecraft System Level Review     Critical Design Review     Mission Operations Review     Pre-Environmental Review     Pre-Storage Review     Pre-Shipment Review     Flight Operations Review     Spacecraft Launch Readiness Review     Software Subsystem Review     Critical Design Review     Test Readiness Review     Acceptance Review   | Document  WS  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27  S-415-27                     | Para.  1.3.4 1.3.5 1.3.6 1.3.7 1.3.7 1.3.8 1.3.9                    |
| O1<br>O2<br>O3<br>O4<br>O4A<br>O5<br>O6                   | Milestones  Description  Spacecraft System Level Review Critical Design Review Mission Operations Review Pre-Environmental Review Pre-Storage Review Pre-Shipment Review Flight Operations Review Spacecraft Launch Readiness Review Software Subsystem Reviews Critical Design Review Test Readiness Review Acceptance Review  Launch Services  | Document  WS  S-415-27   Para.  1.3.4 1.3.5 1.3.6 1.3.7 1.3.7 1.3.8 1.3.9                    |
| O1<br>O2<br>O3<br>O4<br>O4A<br>O5<br>O6                   | Milestones  Description  Spacecraft System Level Review Critical Design Review Mission Operations Review Pre-Environmental Review Pre-Storage Review Pre-Shipment Review Flight Operations Review Spacecraft Launch Readiness Review Software Subsystem Reviews Critical Design Review Test Readiness Review Acceptance Review  Launch Services Launch Vehicle Interface   | Document  WS  S-415-27   Para.  1.3.4 1.3.5 1.3.6 1.3.7 1.3.7 1.3.8 1.3.9                    |
| O1<br>O2<br>O3<br>O4<br>O4A<br>O5<br>O6<br>O7<br>O8<br>O9 | Milestones  Spacecraft System Level Review Critical Design Review Mission Operations Review Pre-Environmental Review Pre-Storage Review Pre-Shipment Review Flight Operations Review Spacecraft Launch Readiness Review Software Subsystem Reviews Critical Design Review Test Readiness Review Acceptance Review  Launch Services Launch Vehicle Interface Requirements Document  | S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 LV-3.8-06                       | Para.  1.3.4 1.3.5 1.3.6 1.3.7 1.3.7 1.3.8 1.3.9                    |
| O1<br>O2<br>O3<br>O4<br>O4A<br>O5<br>O6<br>O7<br>O8<br>O9 | Milestones  Spacecraft System Level Review Critical Design Review Mission Operations Review Pre-Environmental Review Pre-Storage Review Pre-Shipment Review Flight Operations Review Spacecraft Launch Readiness Review Software Subsystem Reviews Critical Design Review Test Readiness Review Acceptance Review Launch Services Launch Vehicle Interface Requirements Document Spacecraft/Launch Vehicle   | S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 LV-3.8-06                       | Para.  1.3.4 1.3.5 1.3.6 1.3.7 1.3.7 1.3.8 1.3.9                    |
| O1<br>O2<br>O3<br>O4<br>O4A<br>O5<br>O6<br>O7<br>O8<br>O9 | Milestones  Description  Spacecraft System Level Review Critical Design Review Mission Operations Review Pre-Environmental Review Pre-Storage Review Pre-Shipment Review Flight Operations Review Spacecraft Launch Readiness Review Software Subsystem Reviews Critical Design Review Test Readiness Review Acceptance Review  Launch Services  Launch Vehicle Interface Requirements Document Spacecraft/Launch Vehicle Interface Control Document                             | S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 LV-3.8-06 LV-3.8-01             | Para.  1.3.4 1.3.5 1.3.6 1.3.7 1.3.8 1.3.9 1.4.5 1.4.6 1.4.7        |
| O1<br>O2<br>O3<br>O4<br>O4A<br>O5<br>O6<br>O7<br>O8<br>O9 | Spacecraft System Level Review Critical Design Review Mission Operations Review Pre-Environmental Review Pre-Storage Review Pre-Shipment Review Flight Operations Review Spacecraft Launch Readiness Review Software Subsystem Reviews Critical Design Review Test Readiness Review Acceptance Review Launch Services Launch Vehicle Interface Requirements Document Spacecraft/Launch Vehicle Interface Control Document Mission Integration Program                            | S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 LV-3.8-06 LV-3.8-01             | Para.  1.3.4 1.3.5 1.3.6 1.3.7 1.3.8 1.3.9 1.4.5 1.4.6 1.4.7        |
| O1<br>O2<br>O3<br>O4<br>O4A<br>O5<br>O6<br>O7<br>O8<br>O9 | Milestones  Spacecraft System Level Review Critical Design Review Mission Operations Review Pre-Environmental Review Pre-Storage Review Pre-Shipment Review Flight Operations Review Spacecraft Launch Readiness Review Software Subsystem Reviews Critical Design Review Test Readiness Review Acceptance Review Launch Services Launch Vehicle Interface Requirements Document Spacecraft/Launch Vehicle Interface Control Document Mission Integration Program Kickoff Review | S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 S-415-27 LV-3.8-06 LV-3.8-01 S-415-27    | Para.  1.3.4 1.3.5 1.3.6 1.3.7 1.3.7 1.3.8 1.3.9  1.4.5 1.4.6 1.4.7 |



|            | (Major Components)   |                       |        |
|------------|--|-----------------------|--------|
| Q16        | Launch Vehicle Design  | S-415-27              | 1.8.6  |
|            | Certification Review   |                       |        |
| O17        | Launch Vehicle Pre-Ship Review   | S-415-27              | 1.8.7  |
| O18        | Pre-VOS Review   | S-415-27              | 1.8.8  |
| O19        | RESERVED   |                       |        |
| O20        | Launch Vehicle Mission Peculiar/   | S-415-27              | 1.8.10 |
|            | Mission Unique Preliminary   |                       |        |
|            | Design Review  |                       |        |
| O21        | RESERVED   |                       |        |
| O22        | RESERVED   |                       |        |
| O23        | RESERVED   |                       |        |
| O24        | RESERVED   |                       |        |
| O25        | Senior NASA Management   | S-415-27              | 1.8.14 |
|            | Mission Readiness Review   |                       |        |
| O26        | Launch Readiness Review  | S-415-27              | 1.8.15 |
|            | System Events  |                       |        |
| Q27        | Spacecraft Engineering Handover  | S-415-27              | 1.3.10 |
| Q28        | Final On-Orbit Acceptance  | Contract Clause       | B.8    |
| O46        | Launch Vehicle ICD   | LV-3.8-01             |        |
| O47        | Preliminary Mission Analysis   | LV-3.8-02             |        |
| O48        | Mission Unique Design Review #1  | S-415-27              | 1.8.10 |
| O49        | Final Mission Analysis   | LV-3.8-03             |        |
| O50        | Mission Unique Design Review #2  | S-415-27              | 1.8.11 |
|            |  |                       |        |
| GOES-P M   | ilestones  |                       |        |
| Milestone  | Description  | Document              | Para.  |
|            | Spacecraft System Level Rev  | iews                  |        |
| P1         | RESERVED   |                       | 1.3.4  |
| P2         | Mission Operations Review  | S-415-27              | 1.3.5  |
| P3         | Pre-Environmental Review   | \$-415-27             | 1.3.6  |
| P4         | Pre-Shipment Review  | S-415-27              | 1.3.7  |
| P5         | Flight Operations Review   | S-415-27              | 1.3.8  |
| P6         | Spacecraft Launch Readiness Review   | \$-415-27             | 1.3.9  |
|            | Software Subsystem Revie   |                       |        |
| P7         | RESERVED   | S-415-27              | 1.4.5  |
| P8         | Test Readiness Review  | S-415-27              | 1.4.6  |
| P9         | RESERVED   | S-415-27              | 1.4.7  |
|            | Launch Services  |                       | **     |
| P10        | RESERVED   |                       |        |
|            | A STATE OF THE STA |                       |        |
| P11        | Spacecraft/Launch Vehicle  | LV-3.8-01             |        |
| P11        | Spacecraft/Launch Vehicle Interface Control Document   | LV-3.8-01             |        |
| P11<br>P12 | Spacecraft/Launch Vehicle Interface Control Document RESERVED  |                       |        |
| P11        | Spacecraft/Launch Vehicle Interface Control Document   | LV-3.8-01<br>S-415-27 | 1.8.3  |



| P15               | Delta IV Pre-Installation Review   | S-415-27                     | 1.8.5  |
|-------------------|--|------------------------------|--------|
|                   | (Major Components)   |                              |        |
| P16               | Launch Vehicle Design  | S-415-27                     | 1.8.6  |
|                   | Certification Review   |                              |        |
| P17               | Launch Vehicle Pre-Ship Review   | S-415-27                     | 1.8.7  |
| P18               | Pre-VOS Review   | S-415-27                     | 1.8.8  |
| P19               | RESERVED   |                              |        |
| P20               | RESERVED   |                              |        |
| P21               | RESERVED   |                              |        |
| P22               | RESERVED   |                              |        |
| P23               | RESERVED   |                              |        |
| P24               | RESERVED   |                              |        |
| P25               | Senior NASA Management   | S-415-27                     | 1.8.14 |
|                   | Mission Readiness Review   |                              |        |
| P26               | Launch Readiness Review  | S-415-27                     | 1.8.15 |
|                   | System Events  |                              |        |
| P27               | Spacecraft Engineering Handover  | S-415-27                     | 1.3.10 |
| 1 4 /             | , The state of the |                              |        |
| P28               | Final On-Orbit Acceptance  | Contract Clause              | B.8    |
|                   |  | Contract Clause<br>LV-3.8-02 |        |
| P28               | Final On-Orbit Acceptance  |                              |        |
| P28<br>P45        | Final On-Orbit Acceptance Preliminary Mission Analysis   | LV-3.8-02                    | B.8    |
| P28<br>P45<br>P46 | Final On-Orbit Acceptance Preliminary Mission Analysis Mission Unique Design Review #1   | LV-3.8-02<br>S-415-27        | B.8    |



# COMPLETION CRITERIA FOR CONTRACTOR DEFINED PAYMENT MILESTONES

- 1. Program Kickoff Meeting and Reviews Satisfactory completion of the Review/Meeting as evidenced by approval by the COTR (or lead NASA Resident Representative) of the Review/Meeting Minutes, including mutually acceptable action item closure plans.
- 2. Subcontract Award Acceptance by subcontractor(s) of contract or letter authority to initiate GOES N-P effort.
- 3. Documentation Delivery Electronic or written acknowledgment by the receiver of receipt of the transmitted item(s) in acceptable condition (including adequacy of the documentation for its intended purpose).
- 4. Hardware & Software Delivery Completed DD250 or DD1149 forms, as appropriate, for hardware and software.

- 5. Contractor Product Delivery Gates Completion of criteria for Satellite and Ground System Delivery Gates per HSC Policy 16-0-1. The Gates and Gate Criteria are listed below.
- 6. Completion Tasks Satisfactory completion of the milestone activity as evidenced by concurrence of the COTR or lead NASA Resident Representative.

Gates and Gate Criteria for Contractor Product Delivery Gates (Criteria type 5)

| No. | Title   | Generic Description  |
|-----|---|--|
| i   | Contract Go-Ahead   | The contract negotiations are complete and the customer requirements are captured and documented in the program contractual documents.   |
| 2   | System Definition<br>Complete                             | The baseline satellite/ground system configuration is established. The satellite and ground system requirements have been allocated to each product business unit. Each product business unit has reviewed and concurred with the requirements, and has an established design baseline that closes in order to meet the system requirements. All subsystem TBDs/TBRs are closed. |
| 3   | Bus Module Layout<br>Complete                             | The physical definition of the bus module is complete including all unit definition, unit locations, harness configuration, antenna tie downs, launch vehicle interface, etc. The bus layout drawings are complete.  |
| 4   | Payload Module<br>Layout Complete                         | The physical definition of the payload module is complete including all unit definition, unit locations, harness configuration, coax routing, waveguide routing, antenna tie downs, etc. The payload layout drawings are complete.   |
| 5   | Antenna Design<br>Complete                                | The electrical design and mechanical configuration are defined. All interfaces to the payload and bus (waveguide, coax, tie-downs, pyrotechnic devices) are complete. Antenna drawings are released.   |
| 6   | Critical Design<br>Review                                 | CDR marks the point in the program where the design is considered to be complete and captured in released hardware drawings. Indicates the manufacturing/build process is ready to commence.   |
| 7   | Start Bus Module<br>Integration                           | Corresponds to the point at which the bus structure/propulsion module, harness and units are complete and ready for bus integration.   |
| 7U5 | Bus Propulsion<br>Subsystem, Liquid<br>and XIP's Complete | <ol> <li>Propulsion installed on Bus and ATP's complete.</li> <li>Propulsion Ordnance installed per MOU requirements.</li> <li>Propulsion hardware documentation from vendors complete (qualification data, unit test data, calibration data, etc.)</li> </ol>   |
| 8   | Start Payload<br>Module Integration                       | Corresponds to the point at which the payload structure, harness, and units are complete and ready for payload integration.  |
| 9   | Bus Module<br>Complete                                    | Corresponds to the completion of the bus module integration and test, all test and process anomalies must be closed, indicating the bus module is ready for integration at the next level.   |
| 10  | Payload Module<br>Complete                                | Corresponds to the completion of the payload module integration and test, all test and process anomalies must be closed, indicating the payload module is ready for integration at the next level.   |



| No. | Title                              | Generic Description  |
|-----|------------------------------------|--|
| 11  | Antenna to<br>Integration          | Corresponds to completion of antenna range testing and completed mechanical assembly of the antenna system. This is when the antenna system is ready for installation on the satellite.  |
| 12  | Satellite to System<br>Test        | The satellite is delivered to Hi-bay for system test.  |
| 12A | Solar Wing to<br>System            | The solar wing is delivered for system test.   |
| 13  | Satellite Complete                 | The satellite is mechanically complete, except for operations that must be conducted at the launch site. All system level testing is complete. All process and test anomalies are resolved and closed. The paperwork tracking the satellite configuration and test status is complete. |
| 14  | Launch                             | All final satellite preparations are complete and configured for launch, the mission control center and remote tracking sites are ready for operations.  |
| 15  | Ground System<br>Design Complete   | Hardware and software designs complete, site ready and facility specification complete.  |
| 16  | Start Ground<br>System Integration | The ground system hardware and satellite operating software is delivered.  |
| 17  | Ground System<br>Complete          | The ground system hardware and software are complete, installed at the customer site, and the site acceptance testing is complete, with all anomalies resolved and closed.   |
| 18  | Mission Complete                   | The transfer orbit and in-orbit test operations are complete. All anomalies are resolved. The satellite is configured for on-station operations.   |

### GOES N

| Milestone | Description                                       | Completion<br>Criteria |
|-----------|---|------------------------|
| N2A.      | Preliminary Design Review Updates                 | 1                      |
| N37A.     | EDDS Hardware / Software Interface                | 1                      |
| N41.      | GOES N and O Team Kickoff                         | 1                      |
| N42.      | Contract Award to Panametrics for SEM Instruments | 2                      |
| N43.      | Deliver Engineering Communications Model Data     | 3                      |
| N44.      | S/C Emulator & PES PDR                            | 1                      |
| N45.      | Gate 3 - GOES Bus Layout Complete                 | 5                      |
| N46.      | Gate 5 - GOES Antenna Design Complete             | 5                      |
| N47.      | RESERVED  |                        |
| N48.      | GTACS/NTACTS Proof-of-Concept Demo                | 6                      |
| N49.      | Gate 4 - GOES Payload Layout Complete             | 5                      |
| N50.      | Communication Subsystem CDR                       | 1                      |
| N51.      | RESERVED  |                        |

| N52. | Version Description Document - Build 4               | 3  |
|------|--|----|
| N53. | REŞERVED   |    |
| N54. | Deliver Flight Communications Model Data             | 4  |
| N55. | Gate 7 - Start Bus Integration                       | 5  |
| N56. | Deliver Ground System SOCC/CDASs                     | 6  |
| N57. | Gate 9 - Bus Complete                                | 5  |
| N58. | GOES N End-to-End Test 1A Completed                  | 6  |
| N59. | Flight Operations Training Program Completed         | 6  |
| N60. | Spacecraft Training Program Plan (Final)             | 3  |
| N61. | Complete Fit Check(Launch Vehicle)/Shock Test        | 6  |
| N62. | GOES N End-to-End Test 2 Completed                   | 6  |
| N63. | RESERVED   |    |
| N64. | INR System Description and Analysis Document (Final) | 3  |
| N65. | Contingency Simulation # 1                           | 6  |
| N66. | RESERVED   | 6  |
| N67. | GOES N Data Book                                     | 6  |
| N68. | GOES N End-to-End Test 4 Completed                   | 6  |
| N69. | Algorithm Design Description – Build 3               | 6  |
| N70. | 1553 Data Bus Diagnostics Features Meeting           | 6  |
| N71. | PES ADD Walk-Thru Review                             | 1  |
| N72. | PES Prototype GUI Demo                               | 6  |
| N73. | PES Delivery   | 4  |
| N74. | Wideband Tape Recorder Delivery & Training           | 6  |
| N75. | Safehold Mode Proposal                               | .6 |
| N76. | Electronic Data Distribution System & Configuration  | 1  |
|      | Management Review                                    |    |
| N77. | Rebaseline Schedule Review                           | 1  |
| N78. | Integration and Test (I&T) Review                    | 1  |

#### Attachment K

# Performance Based Payments Completion Criteria

| N79. | 1st Powered Testing of GOES N Bus Module          | 6        |
|------|---|----------|
| N80. | HSE Delivery to ITT for RTP Checkout              | 6        |
| N81. | Red Team Kick-off Review                          | 1        |
| N82. | GOES N Solar Array Power Test                     | 6        |
| N83. | System Verification Review                        | 1        |
| N84. | GRODAS Implementation                             | 6        |
| N85. | Phase I SSGS Training                             | 6        |
| N86. | Solar Thermal Balance Test of Solar Array Yoke    | 6        |
| N87. | EDDS Upgrade Acceptance                           | 6        |
| N88. | Completion of Spare Comm Boxes                    | 6        |
| N89. | Delivery of SSGS Mods                             | 6        |
| N90. | HSE Acceptance                                    | 4        |
| N91. | Delivery of INR Analytical Tools                  | 6        |
| N92. | GRODAS Data Flow Demonstration                    | 6        |
| N93. | SXI Mass Model Repair                             | 6        |
| N94. | Wide Field Collimator Repair                      | 6        |
| N95. | Delivery of ADI RTS to BSS                        | 6        |
| N96. | Site Acceptance Testing of BSE #1                 | 6        |
| N97. | Site Acceptance Testing of BSE #2                 | 6        |
| N98  | Additional Government Accommodations (Mod 71)     | 6        |
| N99  | Additional Government Accommodations (Mod 77)     | 6        |
| N100 | Launch Vehicle Delta IV Kick-Off                  | 1        |
|      |   |          |
| N102 | Launch Vehicle Integration Schedule Complete      | 3        |
| N103 | Delta IV Compatibility Assessment/CLA             | 6        |
| N104 | Delivery of Generic Delta IV IV&V Models/         | 3        |
|      | Documentation                                     |          |
| N110 | Launch Vehicle Flight Program Verification        | 6        |
| N111 | Delta IV Launch Services Contract Award           | 3        |
| N112 | Perform Post Launch Support IAW SOW Para. 3.6.4.1 | 6        |
| N113 | Complete S/C Training Session (Pre-Launch)        | 6        |
| N114 | Complete S/C Training Session (Post-Launch)       | 6        |
| N115 | Complete S/C Training Session 3&4                 | 6        |
| N116 | ECP-2D Mod Signed                                 | 6        |
| N117 | Build 8 FAT Complete                              | 6        |
| N118 | Build 8 Delivers Complete                         | 6        |
| N119 | Build 9 FAT Complete                              | 6 ,      |
| N120 | Build 9 Deliveries Complete                       | б        |
|      |   |          |
|      |   |          |
|      |   |          |
| n    |   | <u> </u> |

GOES O

| Milestone        |   |                     |
|------------------|---|---------------------|
| ivillestone      | Description   | Completion Criteria |
| O29.             | Gate 7 - Start Bus Integration  | 5                   |
| O30.             | Gate 9 - Bus Complete   | 5                   |
| O31.             | Gate 10 - Payload Complete  | 5                   |
| O32.             | Bus & SEM Instruments Integration & Test Complete   |                     |
| O33.             | RESERVED  | 6                   |
| O34.             | Gate 12 - GOES O S/C to System Test   | 1                   |
| O35.             | Gate 13 - GOES O S/C Complete   | 5                   |
| O36.             | GOES O End-to-End Test 4 Completed  | 5                   |
| O37.             | GOES O Bus Propulsion Subsystem Complete  | 6                   |
| O38.             | Gate 11 - GOES O Antenna to Integration   |                     |
| O39.             | Gate 12A – Solar Wing to System Test  | 5                   |
| O40.             | GOES O Bus Interface Verification Test  | 5                   |
| O41.             | GOES O Yoke Electrical Testing  | 6                   |
| O42,             | GOES O End-to-End Test 2 Completed  | 6                   |
| O43.             | Component & Subsystem Test Data Packages  | 6                   |
|                  | Samponent & Bubsystem Test Bata Fackages  | Document S-415-26   |
| O44              | STE Test Readiness Review (Mod 73)  | SFAT-3.3.1-02       |
| O45              | STE Site Acceptance Test (Mod 73)   | 6                   |
| 051              | Launch Vehicle Flight Program Verification  | 4                   |
| O52              | Complete Fit the Later Visit 1 Notes  | 6                   |
|                  | Complete Fit check (Launch Vehicle)/Shock Test (shock test applies only if required per 8.6.5.3 of the Specification) | 6                   |
|                  | GOES O Spares (GOES P Components)   |                     |
| OSI.             | GOES O Spares Kick-Off Meeting  |                     |
| OS2.             | Place Order to Panametrics – SEM Instruments  | 1                   |
| OS3.             | Place Order for COMDEV Microwave Units  | 2                   |
| OS4.             | Place Order for SAAB Deployable Omni Antenna  | 2                   |
| OS5.             | Place Order for Ball Star Trackers  | 2                   |
| D\$6.            | Order Solar Cells & Yoke  | 2                   |
| O\$7.            | Order Structure Long Lead Parts   | 2                   |
| D\$8.            | Order LHPs  | . 2                 |
| 0\$9.            | Order CCHPs   | 2                   |
| S10.             | Receive Yoke Substrate  | 2                   |
| OS11.            |   | 6                   |
| )S12.            | EP Power Components Complete  | 6                   |
| OS13.            | Structure Composites Fab Complete   | 6                   |
| )\$14.           | Magnetometer Delivery Complete  | 6                   |
| )\$14.<br>)\$15. | Harness Fab Complete  | 6                   |
| )\$15.<br>)\$16. | Aft T&C Omni Complete   | 6                   |
|                  | Battery Fabrication Complete  | 6                   |
| \$17.            | Receive Solar Cells   | 6                   |
| \$18.            | Spacecraft Structure Assembly Complete  | 6                   |
|                  | Panametrics Delivery Complete   | 6                   |
| \$20.            | Gate 11 - Antenna to Integration  | 5                   |

### GOES P

| Milestone | Description  | Completion |
|-----------|--|------------|
|           |  | Criteria   |
| P29.      | Kickoff Meeting  | I          |
| P30.      | Deliver Launch Services Proposal                           | 3          |
| P31.      | Manufacturing Readiness Review                             | 1          |
| P32.      | RESERVED   | 1          |
| P33.      | RESERVED   | 6          |
| P34.      | RESERVED   | 6          |
| P35.      | T&C Subsystem to Integration                               | 6          |
| P36.      | RESERVED   | 5          |
| P37.      | ACS Subsystem to Integration                               | 6          |
| P38.      | Gate 9 - Bus Complete                                      | 5          |
| P39.      | Bus & SEM Instruments Integration & Test Complete          | 6          |
| P40.      | RESERVED   | 6          |
| P41.      | RESERVED   | 6          |
| P42.      | Gate 12 - S/C to System Test                               | 5          |
| P43.      | GFE Integration  | 6          |
| P44.      | Complete EMI/EMC Test                                      | 6          |
| P49       | Launch Vehicle flight Program Verification                 | 6          |
| P50       | RRP1 Settlement (Clause H.22)                              | 6          |
| P51       | Complete fit Check (Launch Vehicle)/Shock Test (shock test | 6          |
|           | applies only if required per 8.6.5.3 of the Specification) |            |
| P52       | Gate 10 Payload Module Test Complete                       | 5          |
| P53       | End to End Test #2 Complete                                | 6          |
| P54       | End to End Test #3 Complete                                | 6          |
| P56       | Settlement Modification Signed and Delivered               | 3          |



#### Attachment K

# PERFORMANCE BASED PAYMENTS COMPLETION CRITERIA

(Contractor Provided Milestones)

January 12, 1998

# COMPLETION CRITERIA FOR CONTRACTOR DEFINED PAYMENT MILESTONES

- 1. Program Kickoff Meeting and Reviews Satisfactory completion of the Review/Meeting as evidenced by approval by the COTR (or lead NASA Resident Representative) of the Review/Meeting Minutes, including mutually acceptable action item closure plans.
- 2. Subcontract Award Acceptance by subcontractor(s) of HSC contract or letter authority to initiate GOES N-Q effort.
- Documentation Delivery Electronic or written acknowledgment by the receiver of receipt of the transmitted item(s) in acceptable condition (including adequacy of the documentation for it's intended purpose).
- 4. Hardware & Software Delivery Completed DD250 or DD1149 forms, as appropriate, for hardware and software.
- 5. HSC Product Delivery Gates Completion of criteria for Satellite and Ground System Delivery Gates per HSC Policy 16-0-1. The Gates and Gate Criteria are listed below.
- 6. Completion Tasks Satisfactory completion of the milestone activity as evidenced by concurrence of the COTR or lead NASA Resident Representative.

#### Gates and Gate Criteria for HSC Product Delivery Gates (Criteria type 5)

| No. | Title                             | Generic Description  |
|-----|-----------------------------------|--|
| 1   | Contract Go-<br>Ahead             | The contract negotiations are complete and the customer requirements are captured and documented in the program contractual documents.   |
| 2   | System Definition<br>Complete     | The baseline satellite/ground system configuration is established. The satellite and ground system requirements have been allocated to each product business unit. Each product business unit has reviewed and concurred with the requirements, and has an established design baseline that closes in order to meet the system requirements. All subsystem TBDs/TBRs are closed. |
| 3   | Bus Module<br>Layout Complete     | The physical definition of the bus module is complete including all unit definition, unit locations, harness configuration, antenna tie downs, launch vehicle interface, etc. The bus layout drawings are complete.  |
| 4   | Payload Module<br>Layout Complete | The physical definition of the payload module is complete including all unit definition, unit locations, harness configuration, coax routing, waveguide routing, antenna tie downs, etc. The payload layout drawings are complete.   |

| No. | Title                                 | Generic Description  |
|-----|---------------------------------------|--|
| 5   | Antenna Design<br>Complete            | The electrical design and mechanical configuration are defined. All interfaces to the payload and bus (waveguide, coax, tie-downs, pyrotechnic devices) are complete. Antenna drawings are released.   |
| 6   | Critical Design<br>Review             | CDR marks the point in the program where the design is considered to be complete and captured in released hardware drawings. Indicates the manufacturing/build process is ready to commence.   |
| 7   | Start Bus Module<br>Integration       | Corresponds to the point at which the bus structure/propulsion module, harness and units are complete and ready for bus integration.   |
| 8   | Start Payload<br>Module Integration   | Corresponds to the point at which the payload structure, harness, and units are complete and ready for payload integration.  |
| 9   | Bus Module<br>Complete                | Corresponds to the completion of the bus module integration and test, all test and process anomalies must be closed, indicating the bus module is ready for integration at the next level.   |
| 10  | Payload Module<br>Complete            | Corresponds to the completion of the payload module integration and test, all test and process anomalies must be closed, indicating the payload module is ready for integration at the next level.   |
| 11  | Antenna to<br>Integration             | Corresponds to completion of antenna range testing and completed mechanical assembly of the antenna system. This is when the antenna system is ready for installation on the satellite.  |
| 12  | Satellite to System<br>Test           | The satellite is delivered to Hi-bay for system test.  |
| 13  | Satellite Complete                    | The satellite is mechanically complete, except for operations that must be conducted at the launch site. All system level testing is complete. All process and test anomalies are resolved and closed. The paperwork tracking the satellite configuration and test status is complete. |
| 14  | Launch                                | All final satellite preparations are complete and configured for launch, the mission control center and remote tracking sites are ready for operations.  |
| 15  | Ground System Design Complete         | Hardware and software designs complete, site ready and facility specification complete.  |
| 16  | Start Ground<br>System<br>Integration | The ground system hardware and satellite operating software is delivered.  |
| 17  | Ground System<br>Complete             | The ground system hardware and software are complete, installed at the customer site, and the site acceptance testing is complete, with all anomalies resolved and closed.   |
| 18  | Mission Complete                      | The transfer orbit and in-orbit test operations are complete. All anomalies are resolved. The satellite is configured for on-station operations.   |

## GOES N

| Milestone | Description  | Completion<br>Criteria |
|-----------|--|------------------------|
| N41.      | GOES N and O Team Kickoff                            | 1                      |
| N42.      | Contract Award to Panametrics for SEM Instruments    | 2                      |
| N43.      | Deliver Engineering Communications Model Data        | 3                      |
| N44.      | S/C Emulator & PES PDR                               | 1                      |
| N45.      | Gate 3 - GOES Bus Layout Complete                    | 5                      |
| N46.      | Gate 5 - GOES Antenna Design Complete                | 5                      |
| N47.      | Deliver GOES N SXI to Spacecraft Mechanical          | 4                      |
|           | Interface  |                        |
| N48.      | GTACS/NTACTS Proof-of-Concept Demo                   | 6                      |
| N49.      | Gate 4 - GOES Payload Layout Complete                | 5                      |
| N50.      | Communication Subsystem CDR                          | 11                     |
| N51.      | Deliver Imager/Sounder S/C Emulator Elements         | 4                      |
| N52.      | Version Description Document - Build 4               | 3                      |
| N53.      | Performance Evaluation System Delivery               | 4                      |
| N54.      | Deliver Flight Communications Model Data             | 4                      |
| N55.      | Gate 7 - Start Bus Integration                       | 5                      |
| N56.      | Deliver Ground System SOCC/CDASs                     | 4                      |
| N57.      | Gate 9 - Bus Complete                                | 5                      |
| N58.      | GOES N End-to-End Test 1A Completed                  | 6                      |
| N59.      | Flight Operations Training Program Completed         | 6                      |
| N60.      | Spacecraft Training Program Plan (Final)             | 3                      |
| N61.      | Complete Fit Check                                   | 6                      |
| N62.      | GOES N End-to-End Test 2 Completed                   | 6                      |
| N63.      | Launch Site Test Procedures                          | 3                      |
| N64.      | INR System Description and Analysis Document (Final) | 3                      |
| N65.      | Contingency Simulation # 1                           | 6                      |
| N66.      | Dress Rehearsal                                      | 6                      |

# GOES O

| Milestone | Description                                       | Completion<br>Criteria |
|-----------|---|------------------------|
| O29.      | Gate 7 - Start Bus Integration                    | 5                      |
| O30.      | Gate 9 - Bus Complete                             | 5                      |
| O31.      | Gate 10 - Payload Complete                        | 5                      |
| O32.      | Bus & SEM Instruments Integration & Test Complete | 6                      |

## GOES P

| Milestone | Description   | Completion |
|-----------|---|------------|
|           |   | Criteria   |
| P29.      | Kickoff Meeting                                     | 1          |
| P30.      | Deliver Launch Services Proposal                    | 3          |
| P31.      | Manufacturing Readiness Review                      | 1          |
| P32.      | Preliminary Design Review (If req'd)                | 1          |
| P33.      | Transfer SEM instruments from precontractual stores | 6          |
| P34.      | Communication Subsystem to Integration              | 6          |
| P35.      | T&C Subsystem to Integration                        | 6          |
| P36.      | Gate 11 - Antenna to Integration                    | 5          |
| P37.      | ACS Subsystem to Integration                        | 6          |
| P38.      | Gate 9 - Bus Complete                               | 5          |
| P39.      | Bus & SEM Instruments Integration & Test Complete   | 6          |
| P40.      | S/C Unit Integration Complete                       | 6          |
| P41.      | SEM Instruments Integration & Test                  | 6          |
| P42.      | Gate 12 - S/C to System Test                        | 5          |
| P43.      | GFE Integration                                     | 6          |
| P44.      | Complete EMI/EMC Test                               | 6          |

# GOES Q

| Milestone | Description   | Completion |
|-----------|---|------------|
|           |   | Criteria   |
| Q29.      | Kickoff Meeting                                     | 1          |
| Q30.      | Deliver Launch Services Proposal                    | 3          |
| Q31.      | Manufacturing Readiness Review                      | 1          |
| Q32.      | Preliminary Design Review (If req'd)                | 1          |
| Q33.      | Transfer SEM instruments from precontractual stores | 6          |
| Q34.      | Communication Subsystem to Integration              | 6          |
| Q35.      | T&C Subsystem to Integration                        | 6          |
| Q36.      | Gate 11 - Antenna to Integration                    | 5          |
| Q37.      | ACS Subsystem to Integration                        | 6          |
| Q38.      | Gate 9 - Bus Complete                               | 5          |
| Q39.      | Bus & SEM Instruments Integration & Test Complete   | 6          |
| Q40.      | S/C Unit Integration Complete                       | 6          |
| Q41.      | SEM Instruments Integration & Test                  | 6          |
| Q42.      | Gate 12 - S/C to System Test                        | 5          |
| Q43.      | GFE Integration                                     | 6          |
| Q44.      | Complete EMI/EMC Test                               | 6          |